IRON & COAL

THE IRON AND COAL TRADES' REVIEW

VOL. 183 Offices: John Adam House, 17/19, John Adam Street, London, W.C.2. Registered as a Newspaper.
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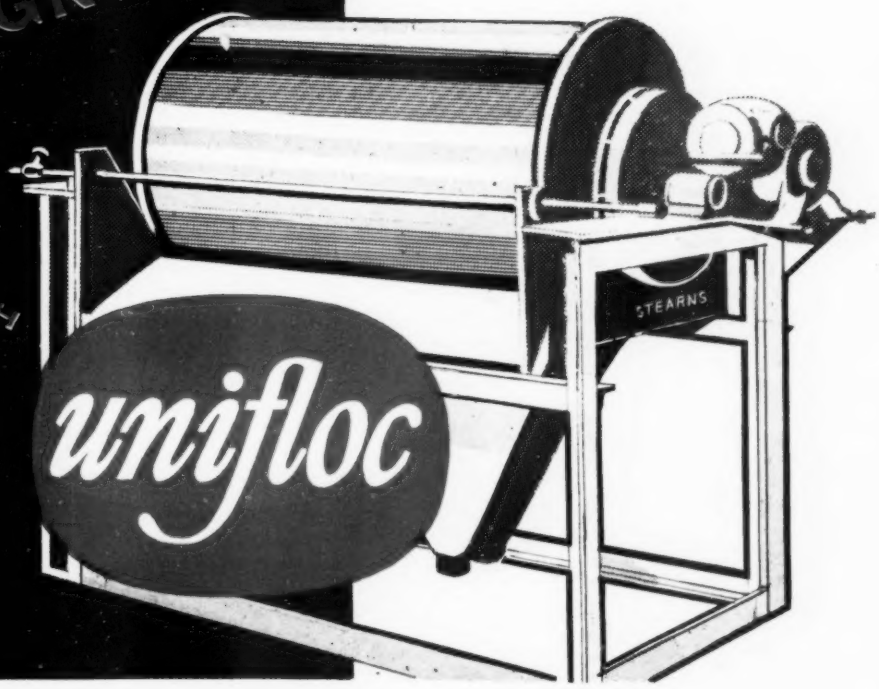
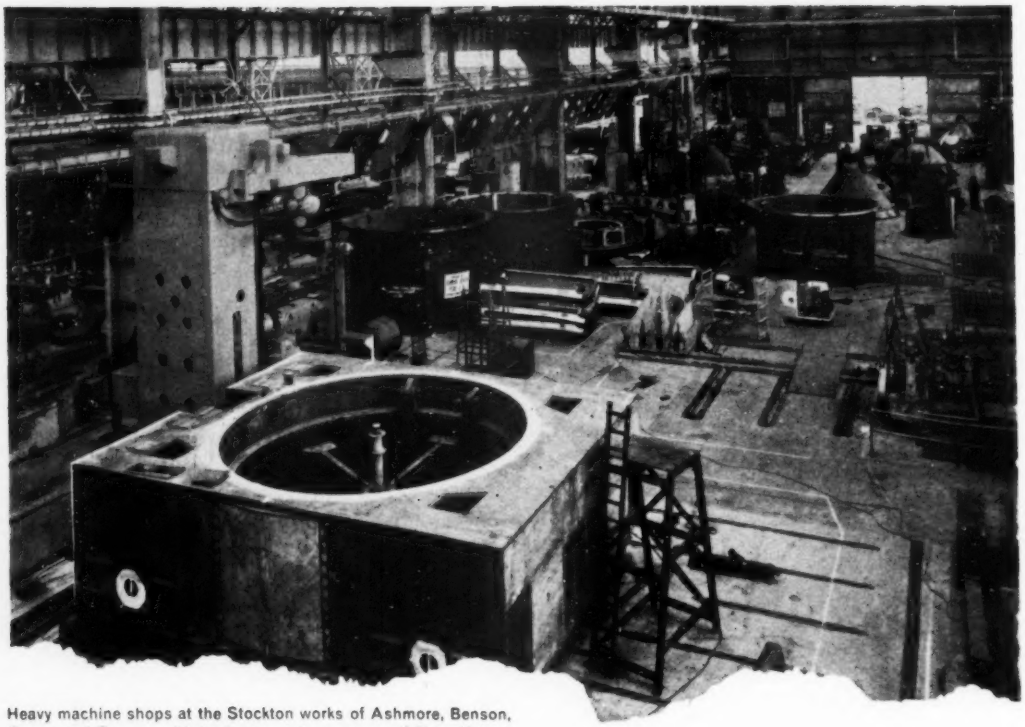
CONFER WITH

'UNIFLOC/STEARNS' PERMANENT MAGNET DRUM SEPARATOR



UNIFLOC LIMITED SWANSEA

Steel PROCESS PLANT



Heavy machine shops at the Stockton works of Ashmore, Benson, Pease and Company Limited, associate company of Davy-United, where fabricated steel process plant and equipment in excess of 100 tons is handled

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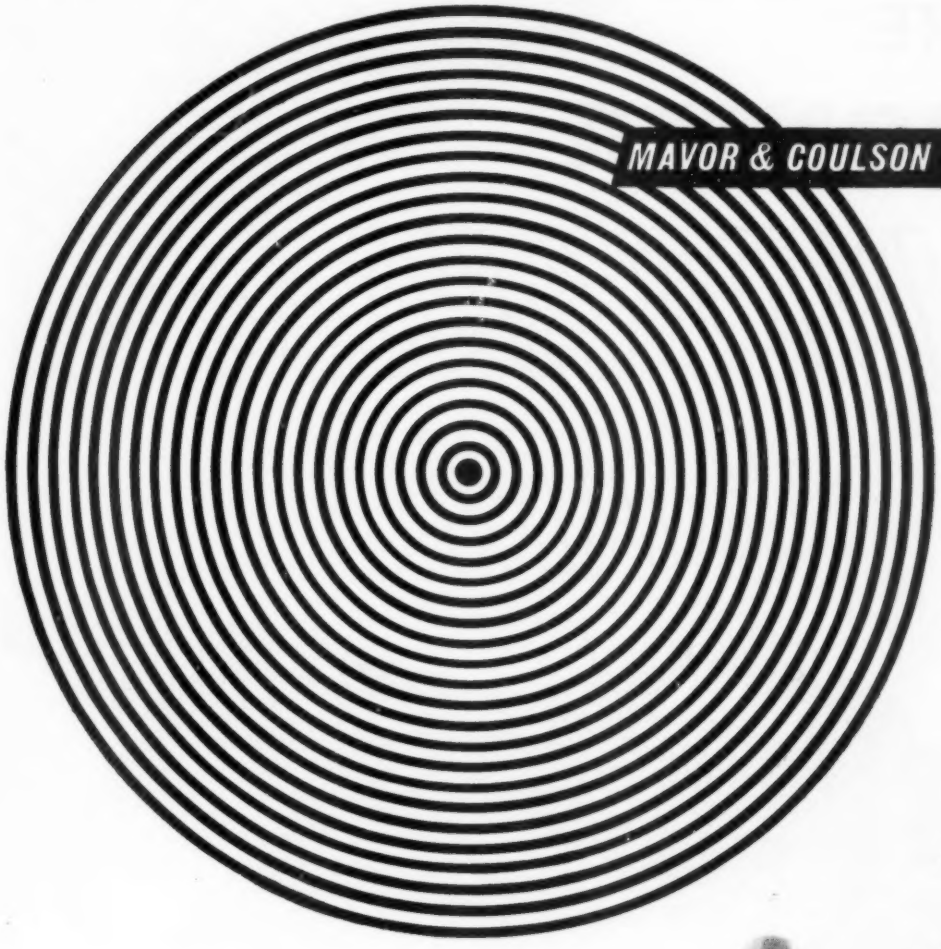
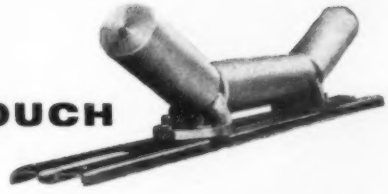


M&C IDLERS SPIN AT A TOUCH



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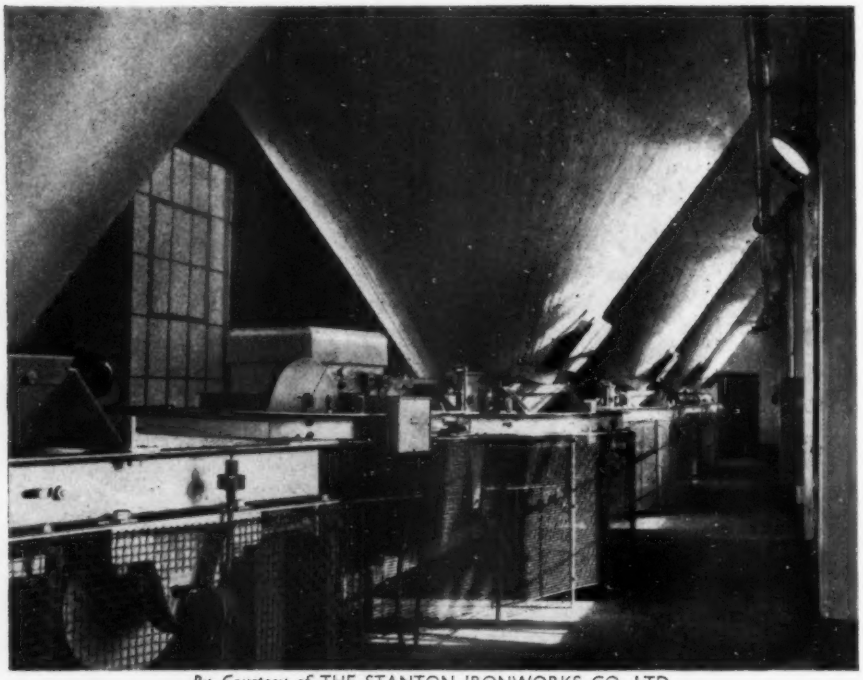

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IF YOU KNOW THE ROPES

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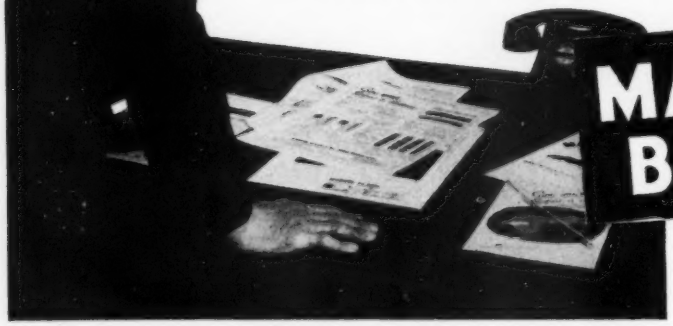
"*Give your Ropes a Chance*" by reading the Martin-Black series of leaflets which contain much useful and interesting information. We will be pleased to send your copy/copies on request.



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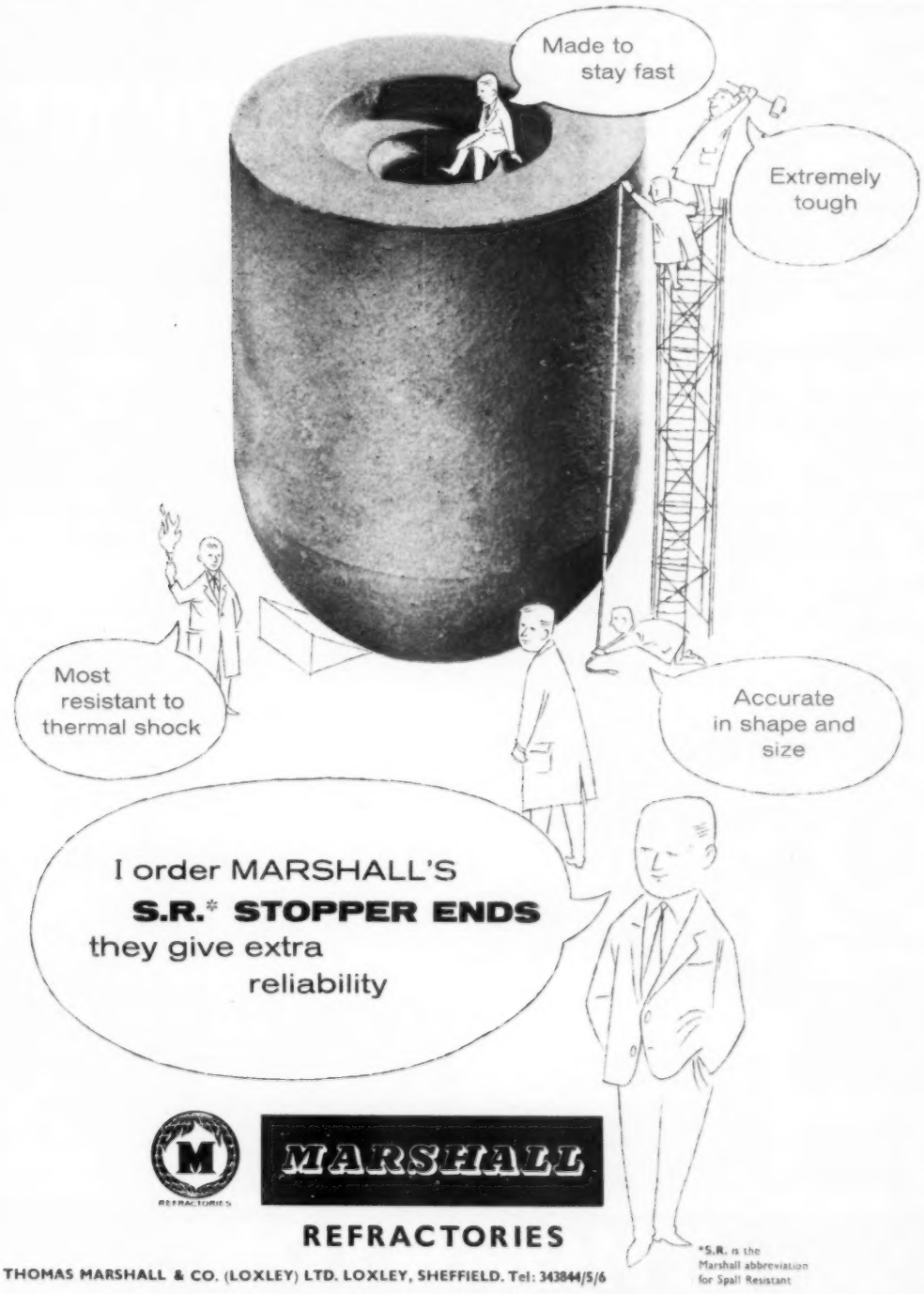

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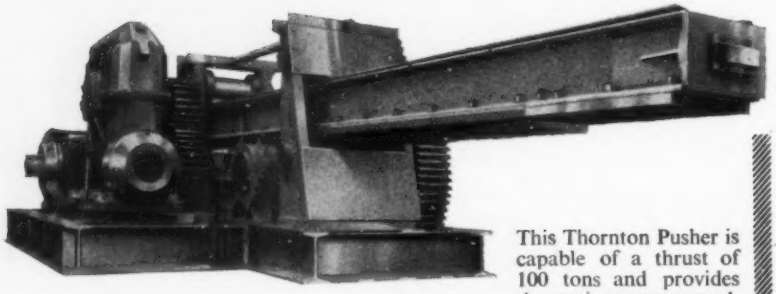
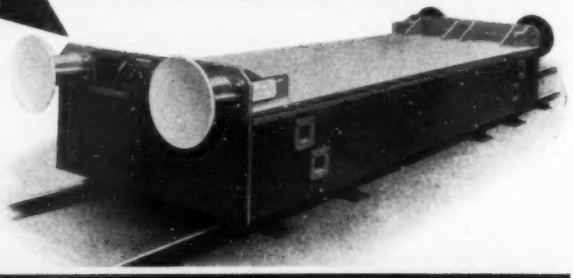
ANOTHER 100 TON FURNACE PUSHER...



This Thornton Pusher is capable of a thrust of 100 tons and provides the motive power to push a continuous train of ingot or slab furnace cars through the furnace.

60 TON CAPACITY CAR FOR SHOT BLASTING...



We designed this car with all-round rubber screening to provide added protection when bearing heavy castings for cleaning in a shot-blast chamber.

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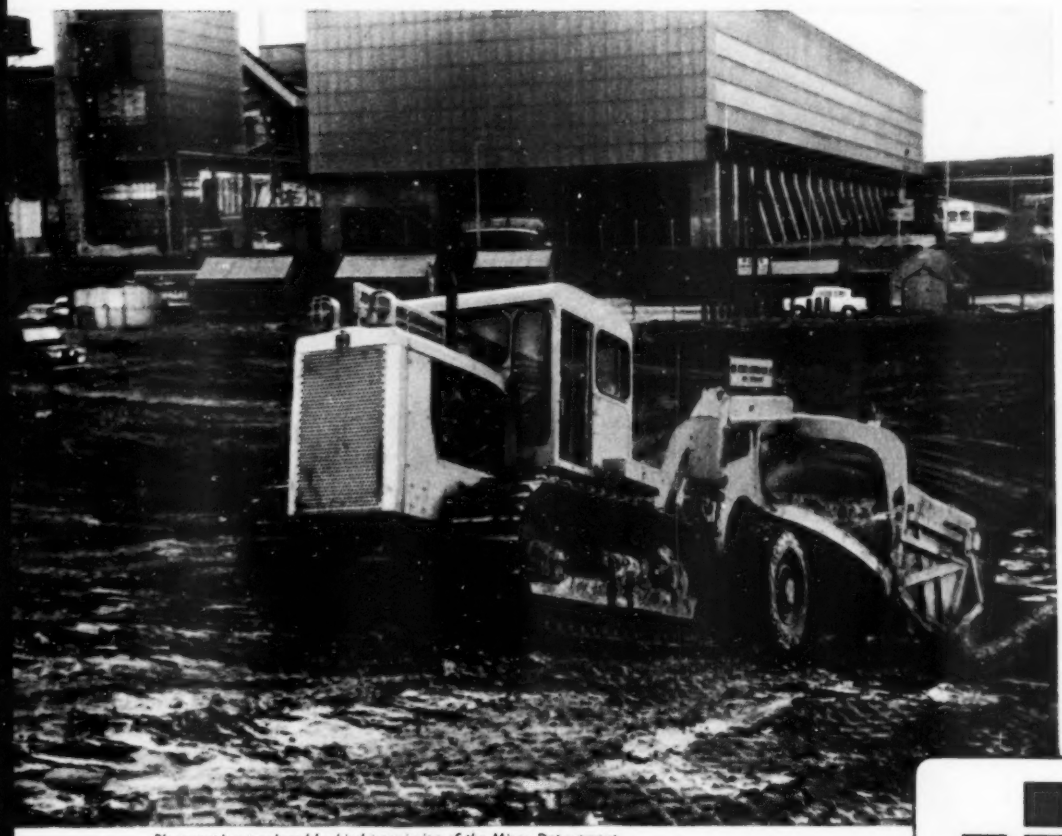

Photograph reproduced by kind permission of the Mines Department of Lysaght's Scunthorpe Works, a branch of G.K.N. Steel Co. Ltd.

Lysaght's Scunthorpe Works use a fleet of International BTD-20 and 10/14 yd. scraper units for the continuous task of removing heavy overburden at their ironstone quarries adjacent to the steel works. Illustrated in action is one of these outfits, which continue to provide a significant contribution to Britain's vital Steel Industry.

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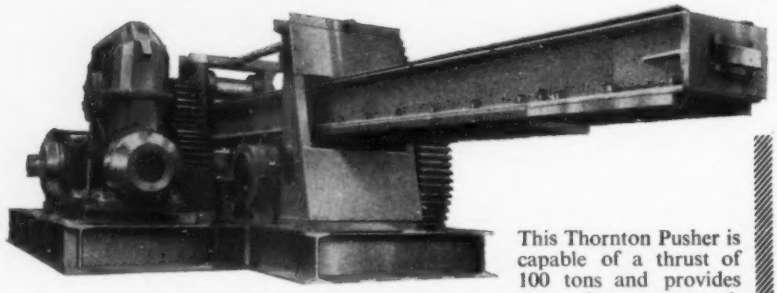

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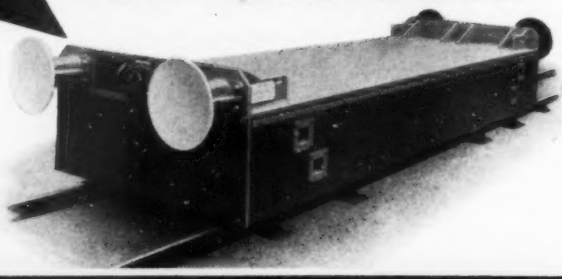

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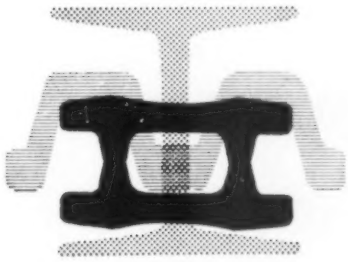

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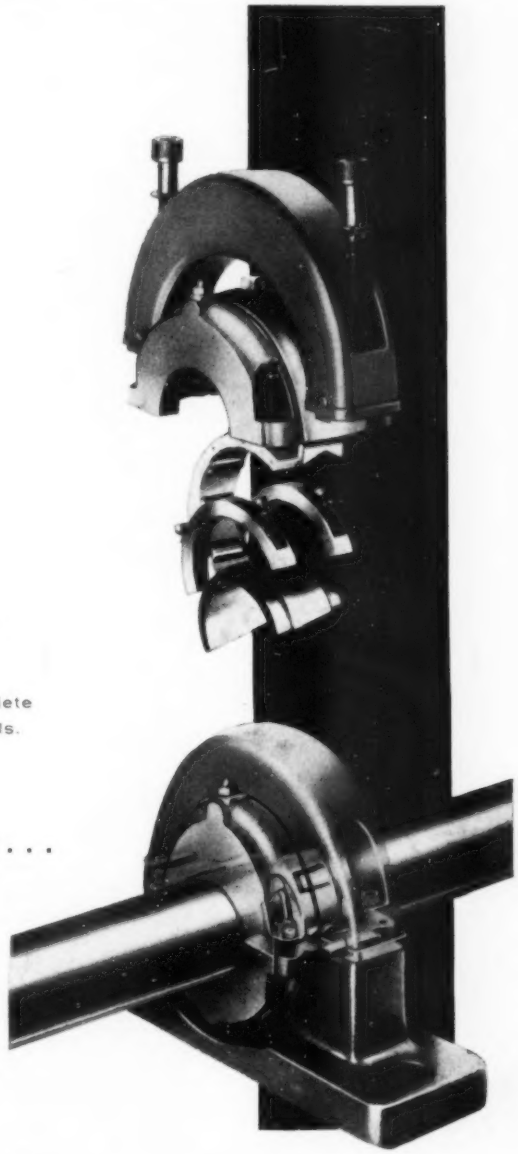

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COAL BUNKER UNITS

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THE CRAWLEY MIDGET MINER

Operation

1 As boring arms rotate coal passes from one arm to next until outer arm loads on to conveyor.
2 Peripheral side cutting chain clears the coal not loaded by trepanning arms and completes loading.

Semi-Automatic Control

Can be fitted with sensing device consisting of gamma ray source which automatically adjusts vertical height of machine depending upon the relative thickness of coal and rock between the source and the receiver due to preferential scattering by rock as compared with coal.

Appreciation

1 The first practical thin seam miner.
2 The first thin seam miner under semi-automatic control.

A Low Seam Wide Buttock Loader For Seams 18 in. and upwards.

Performance

1 Seams 18 in. to 30 in.
2 Depth of cut 4ft. 6in. to 4ft. 9in.
3 200 tons per shift in 2ft. 6in. seam actually achieved.

Specifications

1 Single-ended longwall cutting machine with four boring arms phased at an angle of 72° to each other.
2 Boring arms operated ahead of periphery chain clearing uncut and unloaded coal.
3 Chain includes flight picks bored to ensure complete coal loading.
4 Water jet dust suppression system.
5 Cutting height adjusted by fitting jib inserts.

All Crawley Heavy Duty Machines have the following units standard and interchangeable:

DRIVE FRAME • GEAR BOX • GEAR ASSEMBLIES
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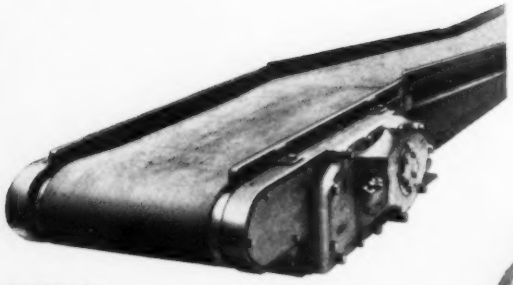
Compact & Reliable Conveyors

with Neoprene lagged drums

for handfilled faces



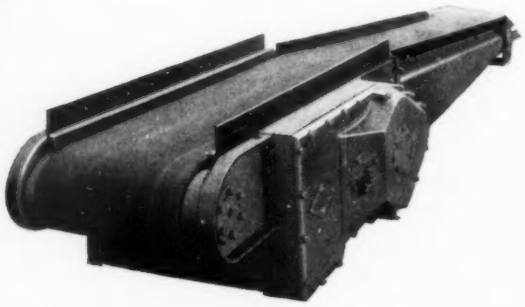
25F/1

is the well proved 25F with Neoprene lagged drums. The electric motor is continuously rated at 25 h.p.

R/9/8

is the version of the R/9/1 with Neoprene lagged drums.

The electric motor is continuously rated at 15 h.p.



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Face Belt Conveyors

BRITISH JEFFREY-DIAMOND LTD., MINING DIVISION, WAKEFIELD, YORKSHIRE

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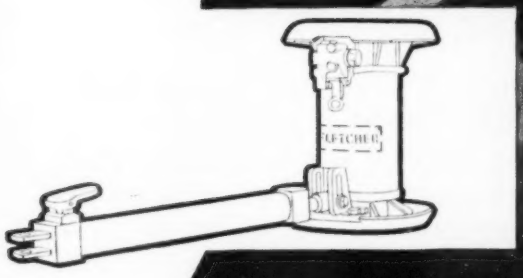
FLETCHER DESFORD CHOCKS

in action



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Following successful installations in the East Midlands Division, the Fletcher Desford hydraulic chock has gained a reputation for reliability.

50 and 100 ton versions: 6″ to 18″ stroke at 2″ intervals.

Fully approved by N.C.B —H.15 and H.11.

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double-acting hydraulic ram up to 2′-6″ stroke

detachable ram anchor brackets

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Full technical information from

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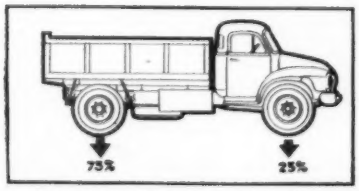
Economy



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Vauxhall Motors Ltd., Luton, Bedfordshire

Vertical or horizontal

streamlined or functional

THE INCREDIBLY VERSATILE VERSO

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VERTICAL OR HORIZONTAL
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THE VERSO
FITS YOUR PLANS PERFECTLY

The Verso has all the famous features of Holroyd reliability and high efficiency. Centrifugally cast Holfos wormwheel; case-hardened and profile ground alloy steel worm; ball bearings throughout; rigid cast iron casing and oil bath lubrication requiring no attention over long periods. Output speeds are from 14 to 300 rpm. Output torques up to 750 lb. ins. Standard motors from ¼ up to 2 hp.

Please write for catalogue V.60 which gives further technical information.

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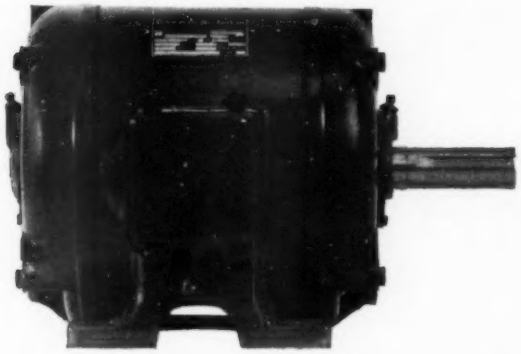

You can usually divide the designing of any piece of equipment into two parts. The first—mainly theoretical—determining the basis of performance; the second—mainly practical—concerned with how the thing shall be made. Whereas the first proceeds from well-established principles held in common by all engineers, the second draws largely on the experience which has been accumulated over the years by a single manufacturer: his know-how. It is usually on this second aspect of design that the differences between one manufacturer's product and another's depends.

This thing called know-how

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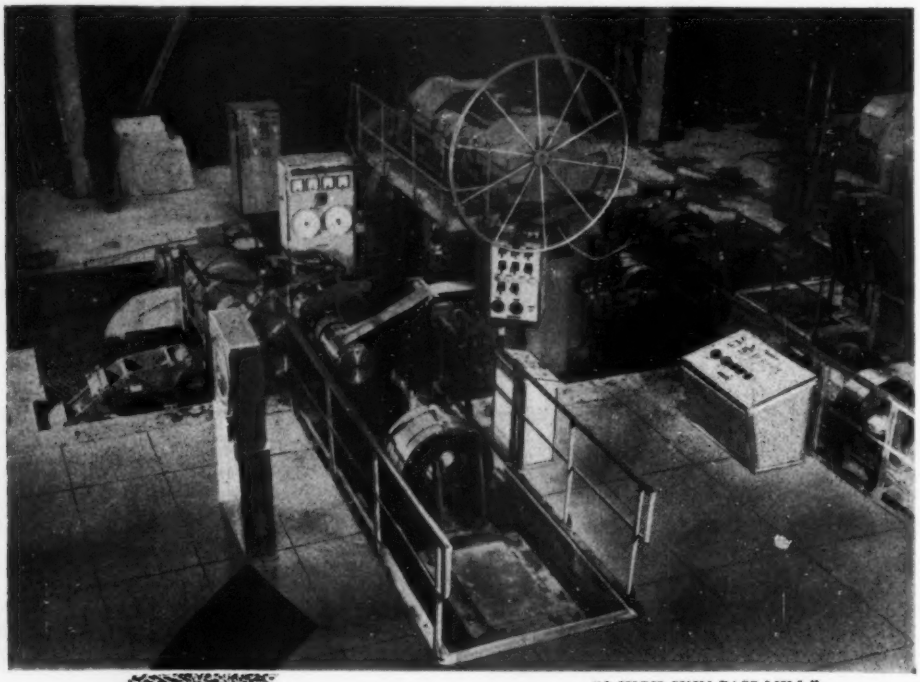

"2 HIGH SKIN PASS MILL"
Photograph by courtesy of
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FARMER NORTON

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For Rolling Mills

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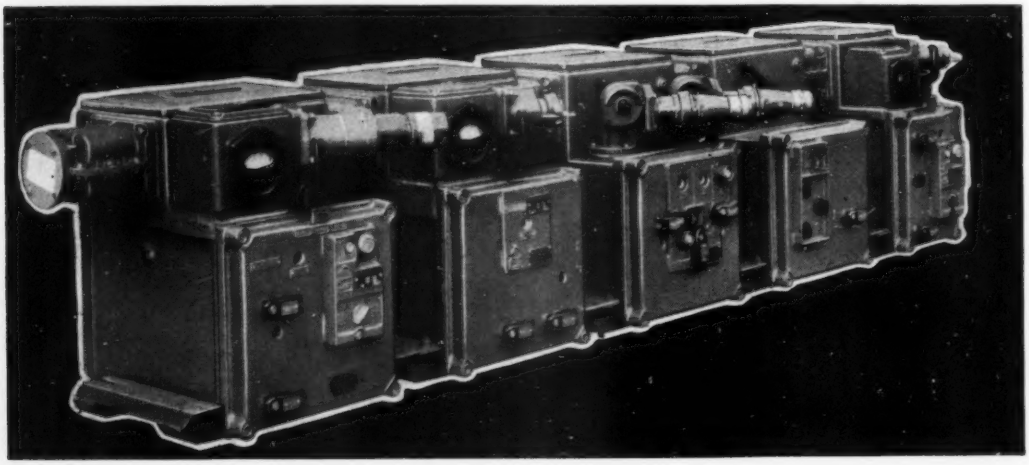

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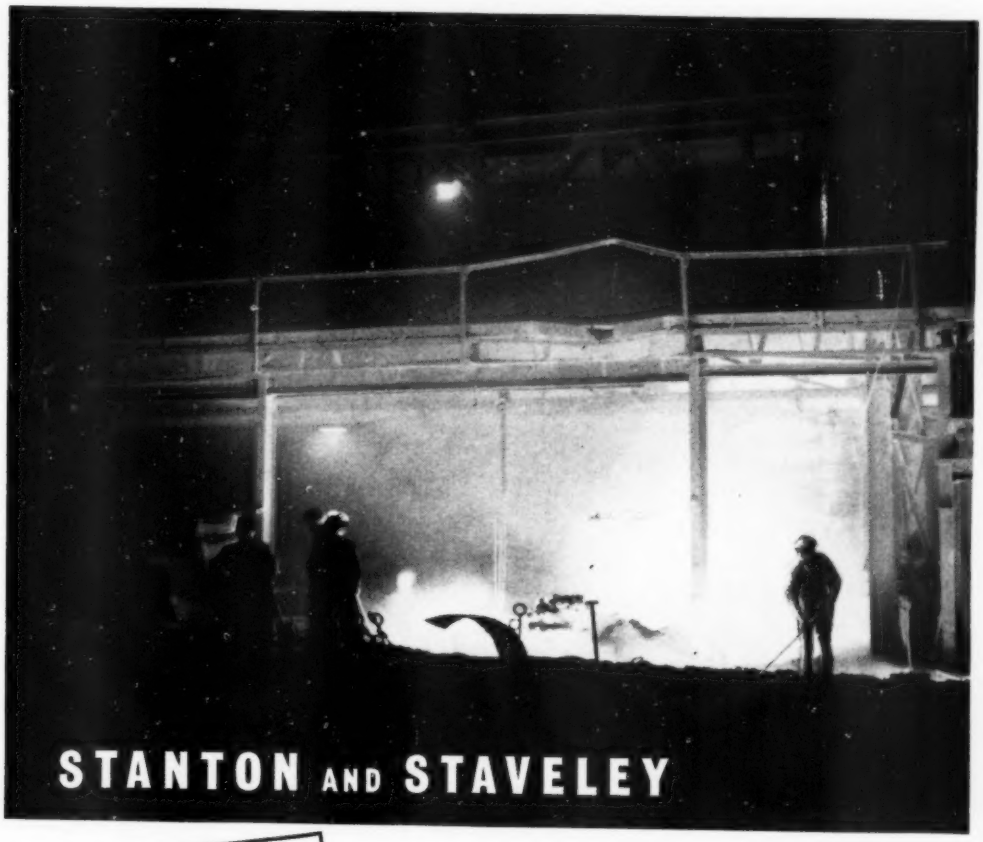

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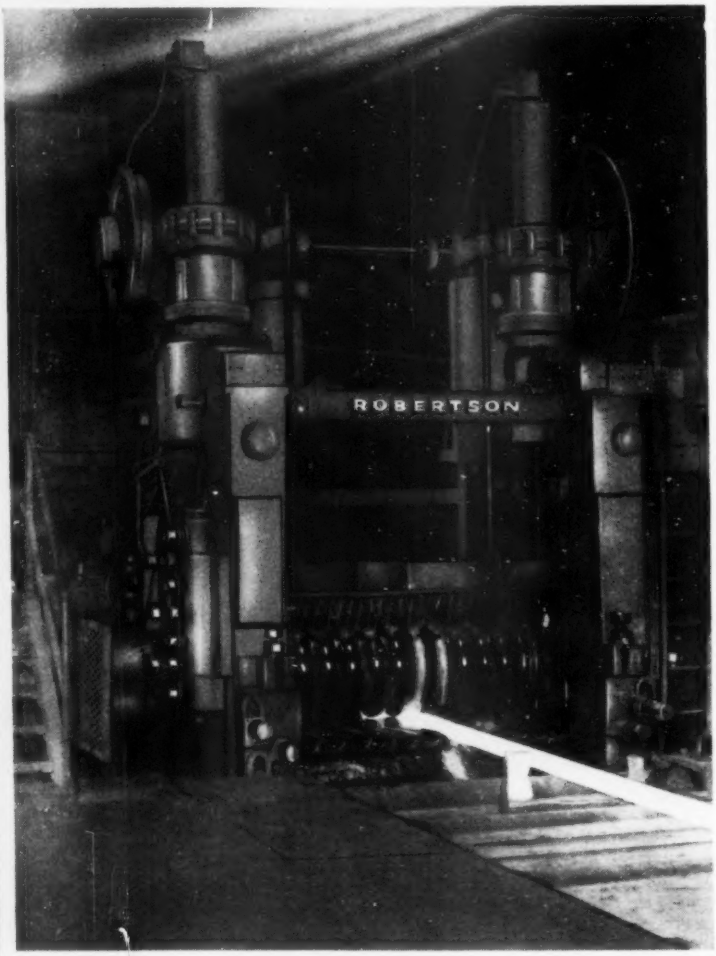

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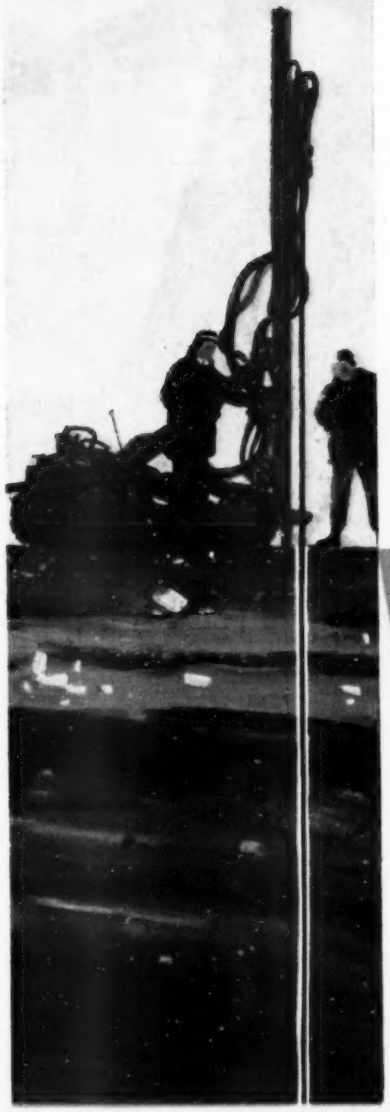

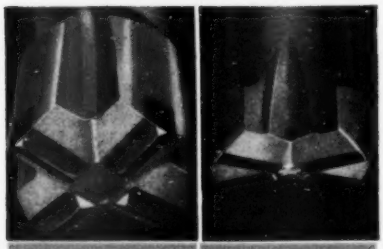

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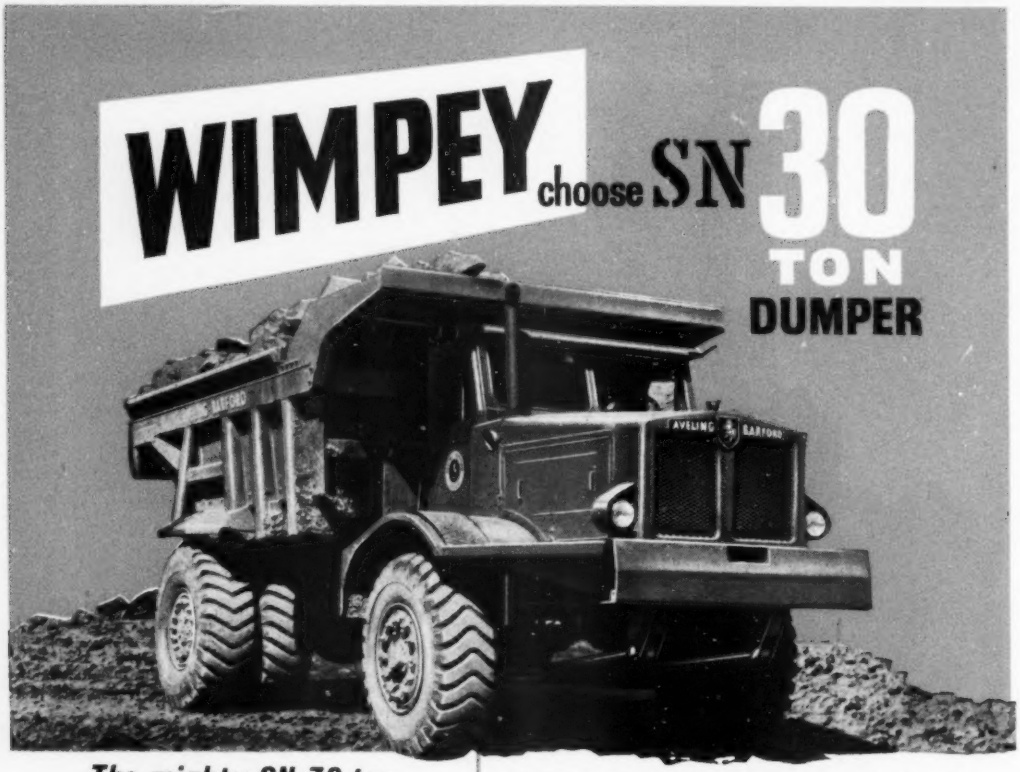
WIMPEY choose SN 30 TON DUMPER



The mighty SN 30 ton outperforms all dumpers in its class!

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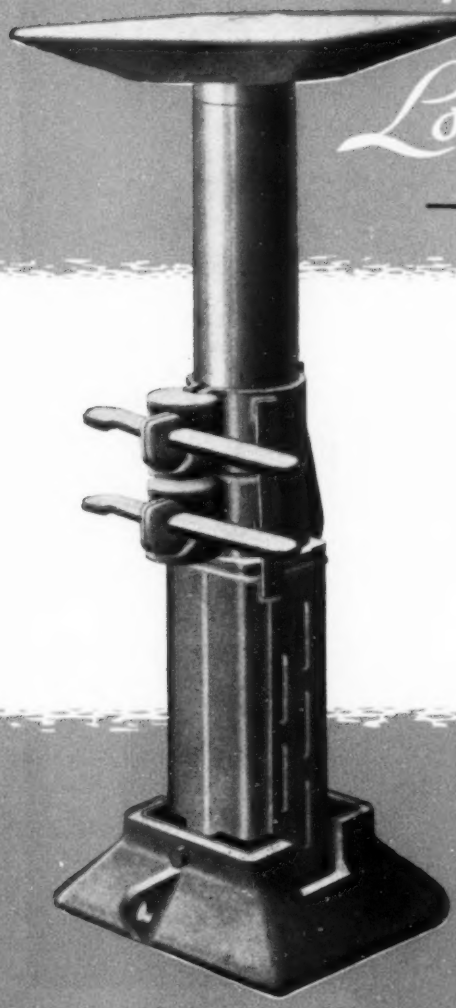

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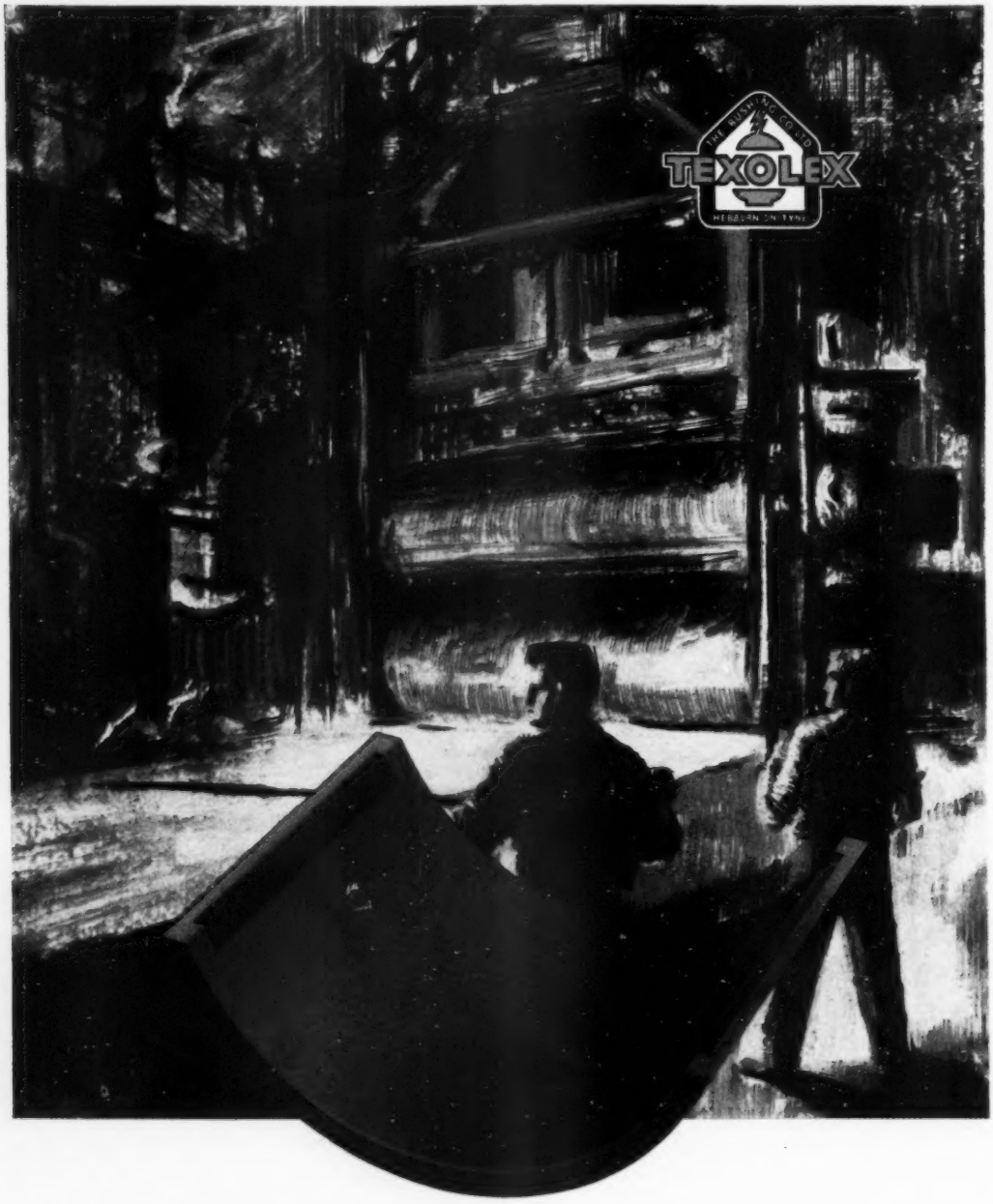

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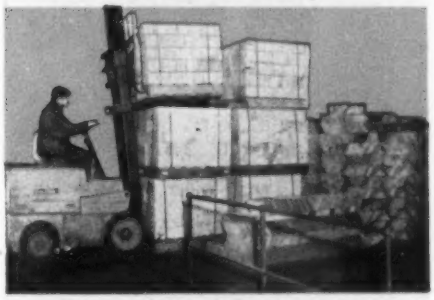
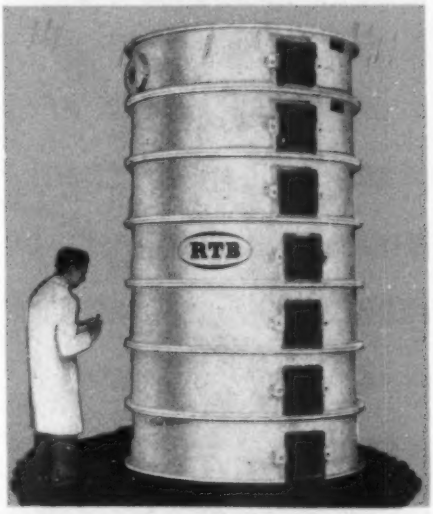
(Left) 14 cwt. capacity ingot mould. (Right) 20-ton capacity ingot mould.

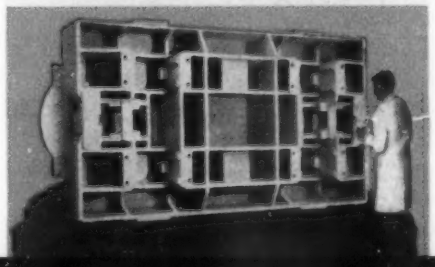


Silica bricks in one of our despatch bays.

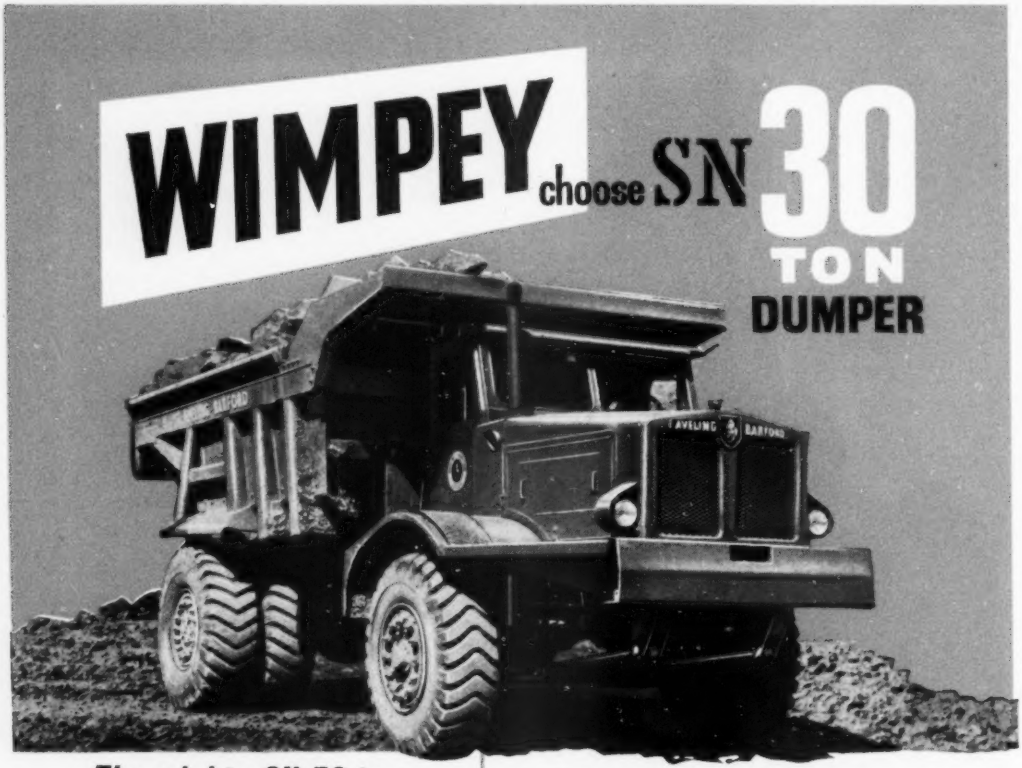


Reactor boxes cast in spheroidal graphite (nodular) iron for the International Nickel Company (Mond) Ltd. Clydach, Swansea.

View of underside of 80-ton capacity ingot car supplied to Ebbw Vale Steel Works.



WIMPEY choose SN 30 TON DUMPER



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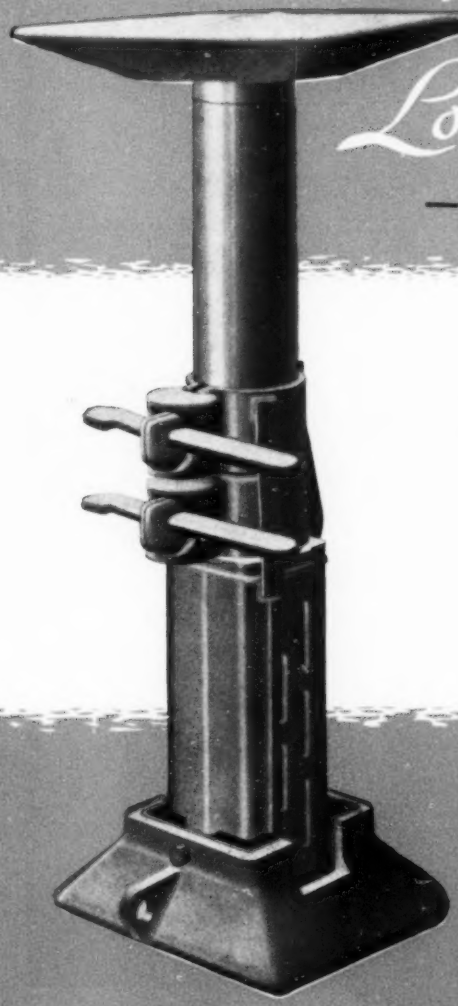

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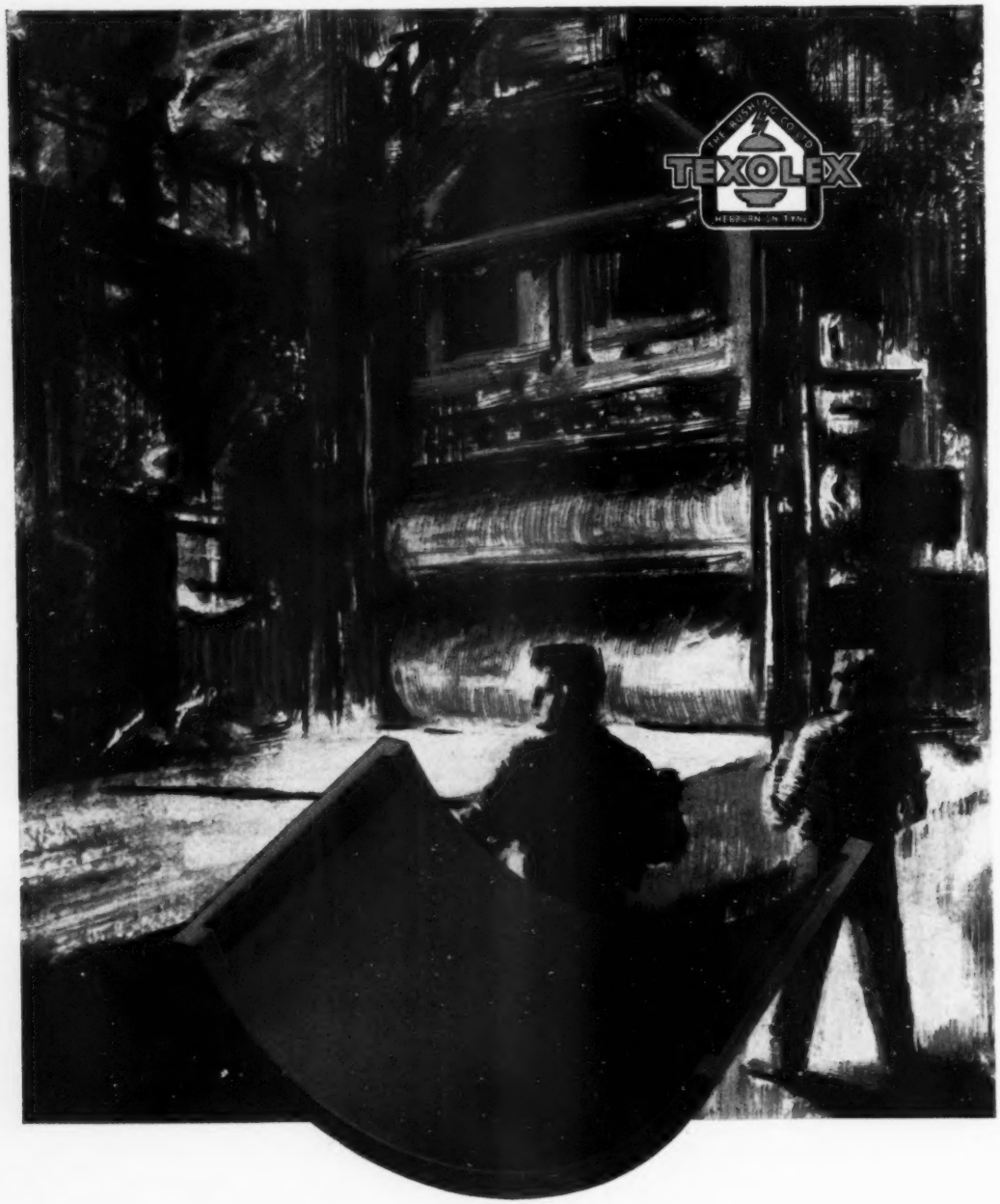

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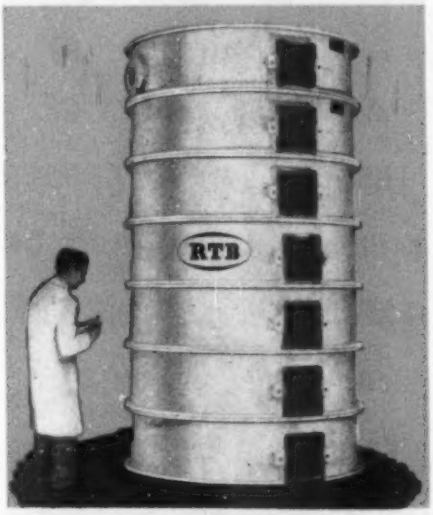

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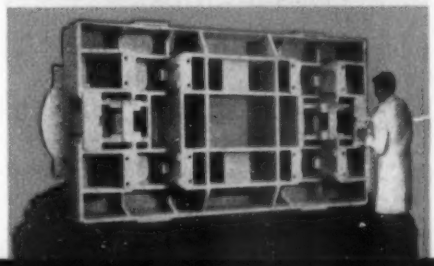

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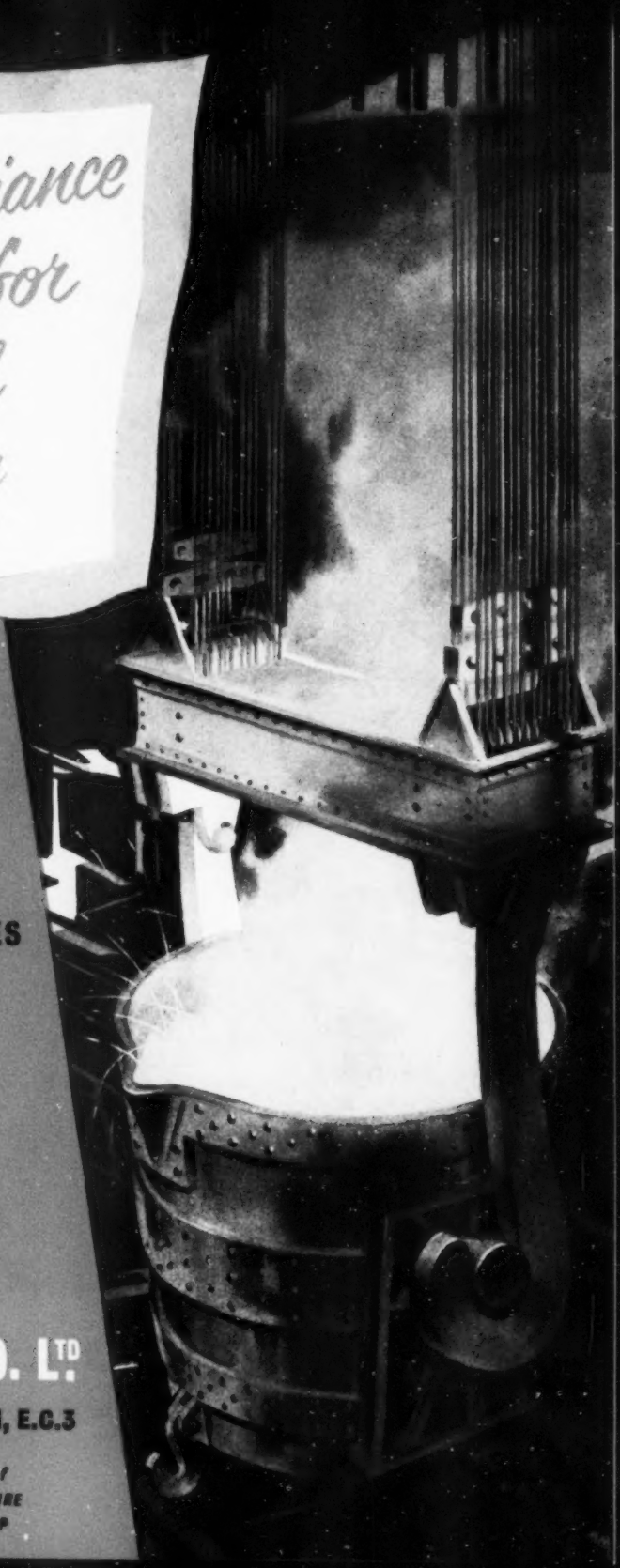

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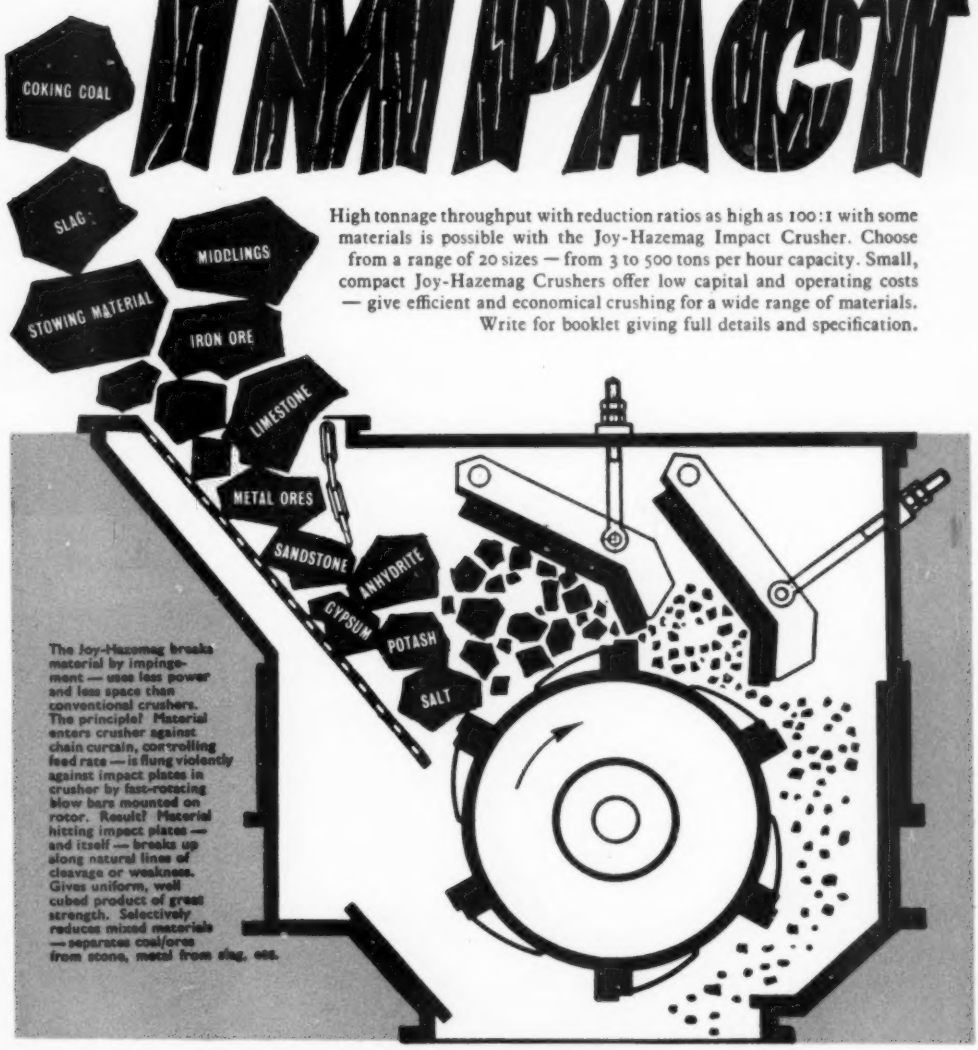
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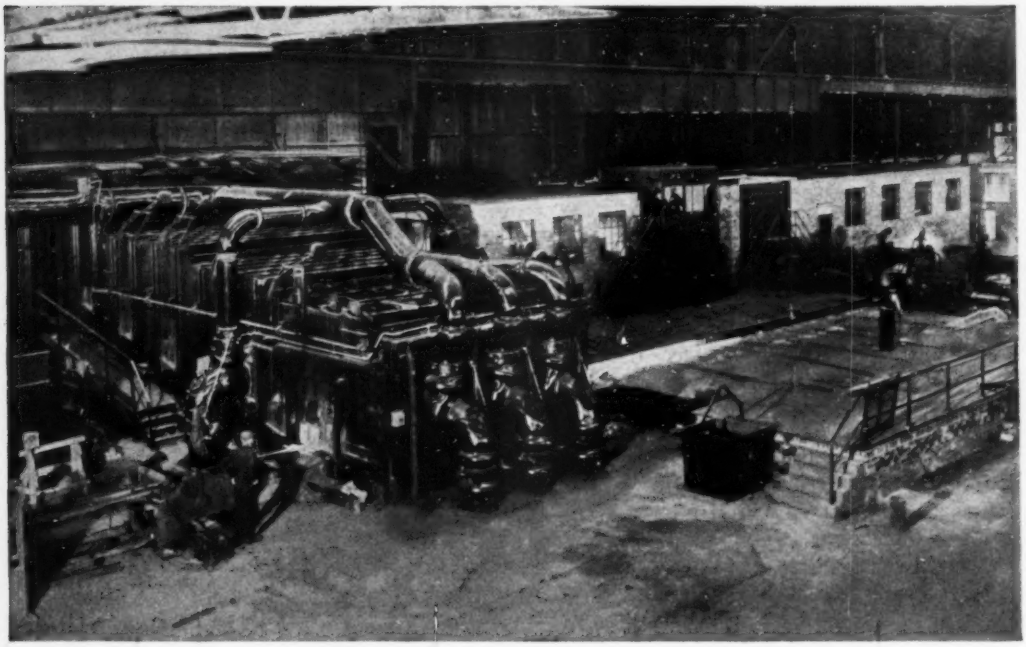

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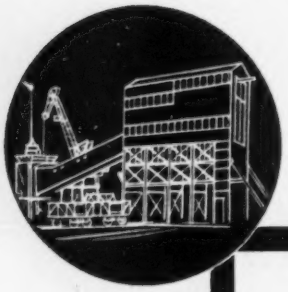
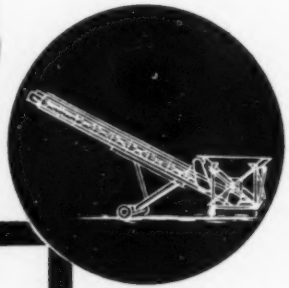


Coal Screening Plant



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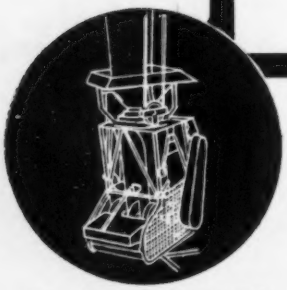
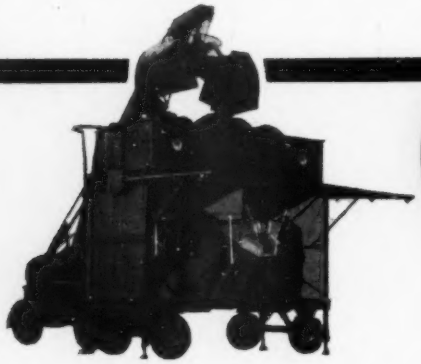
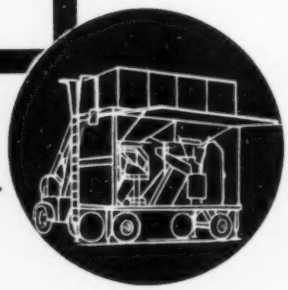


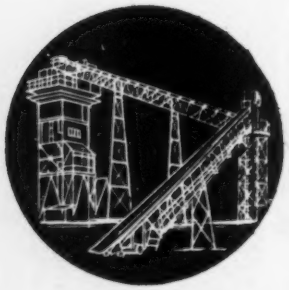
Meteor Thrower (Suspended)



A Crone & Taylor Bagging Unit



Bagging Unit



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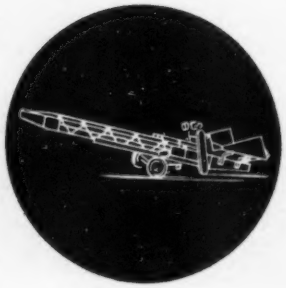

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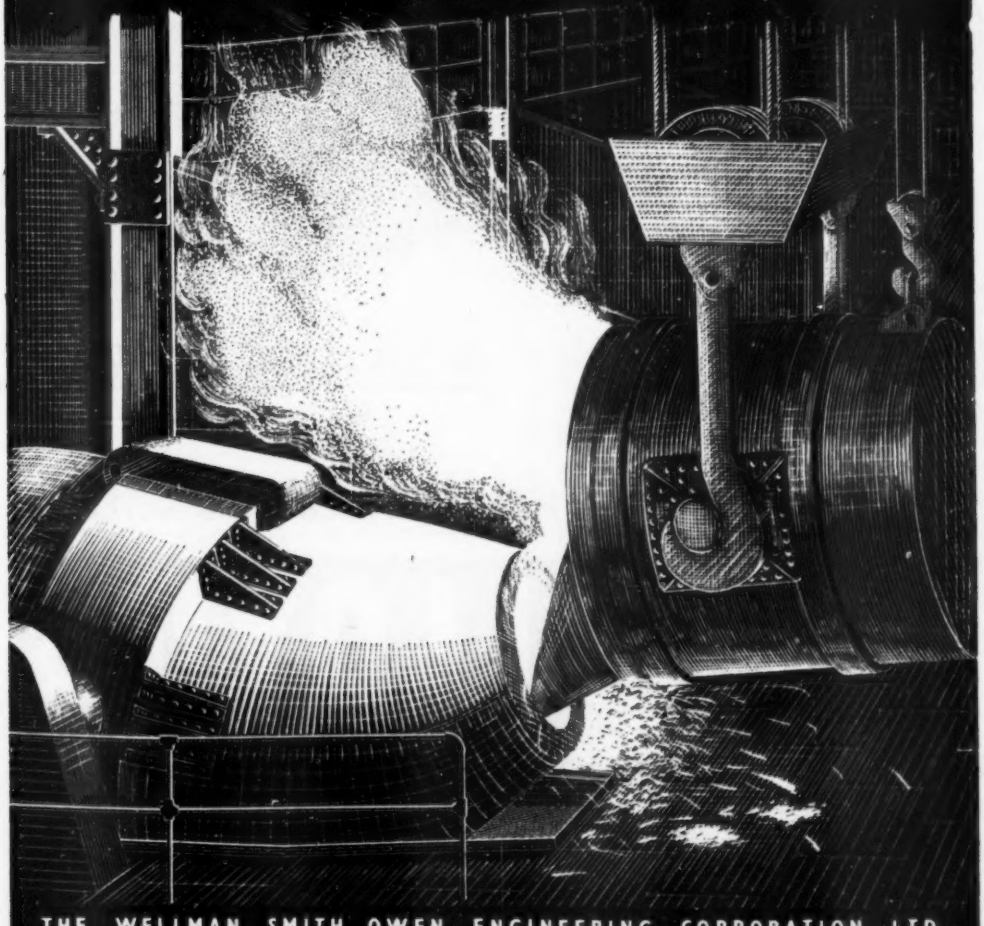

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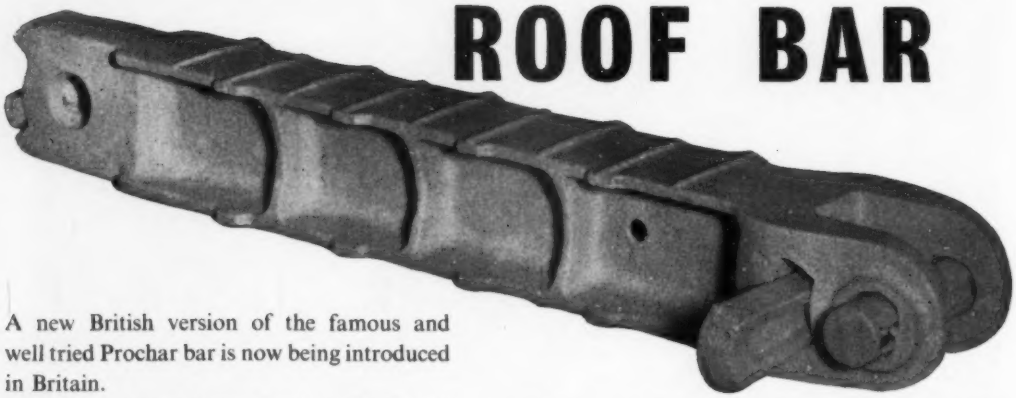

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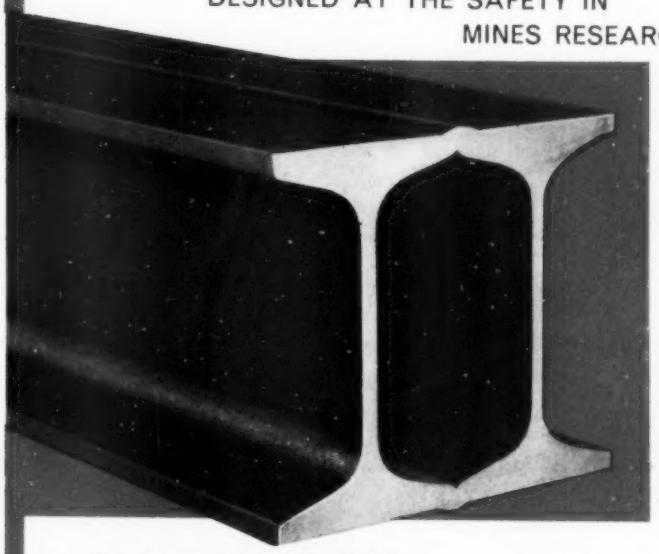

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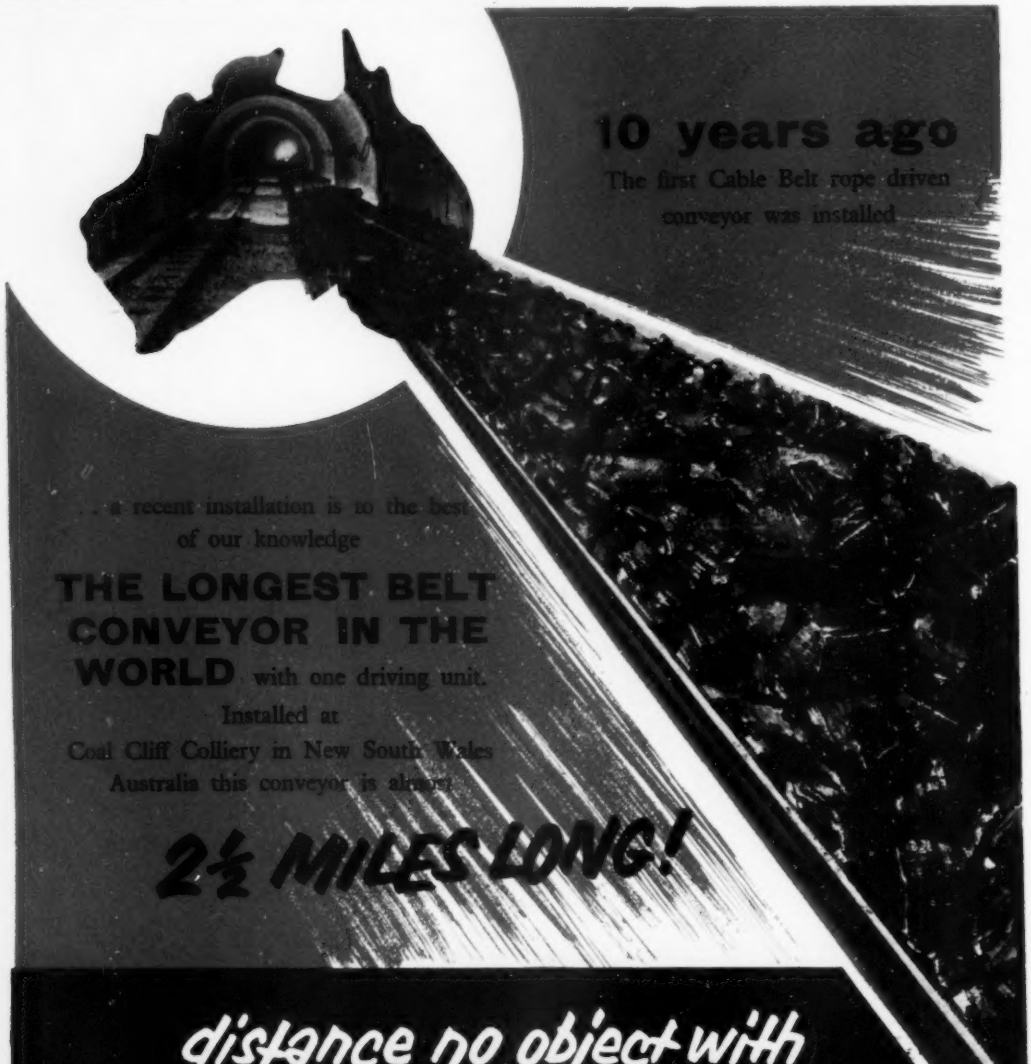

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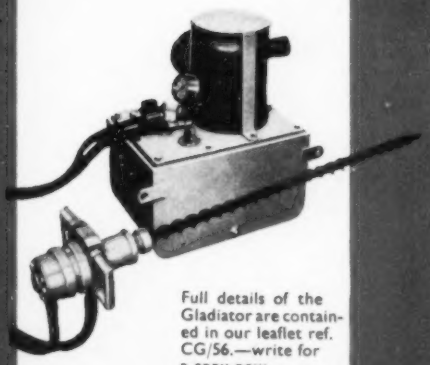

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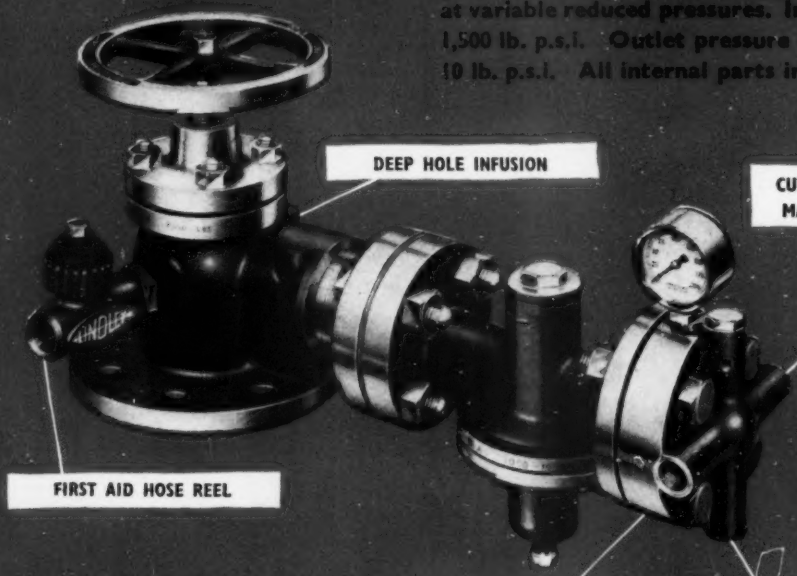
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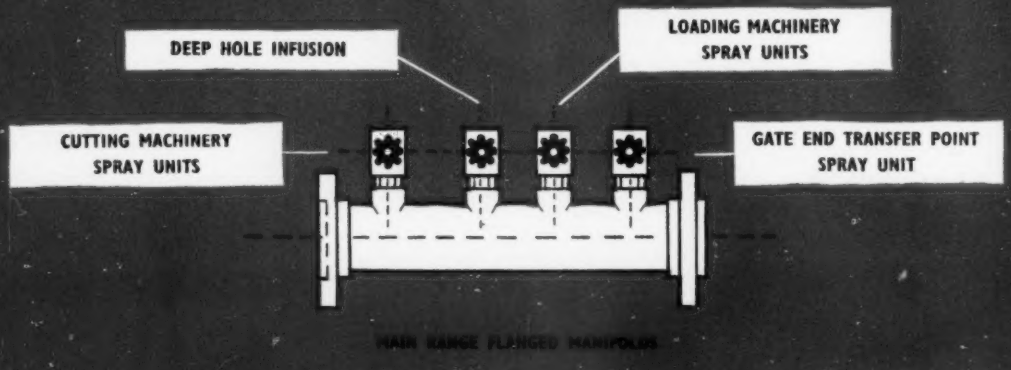
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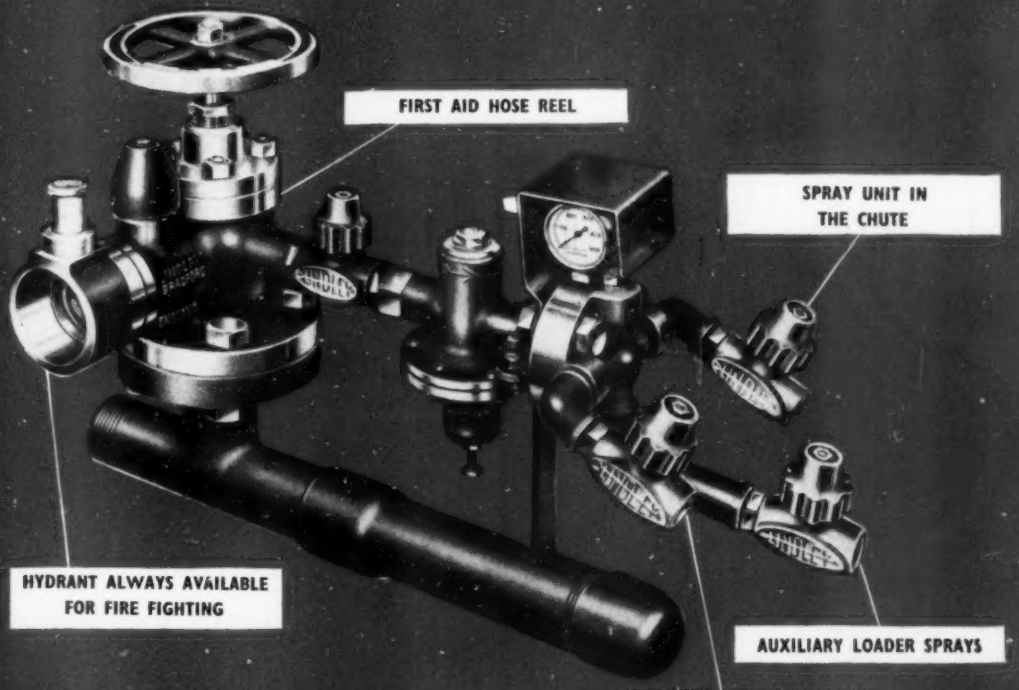
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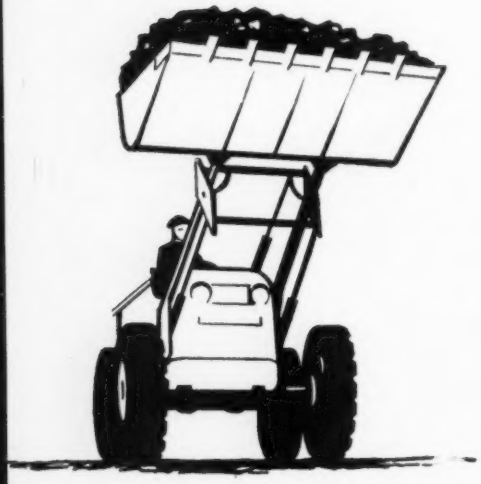

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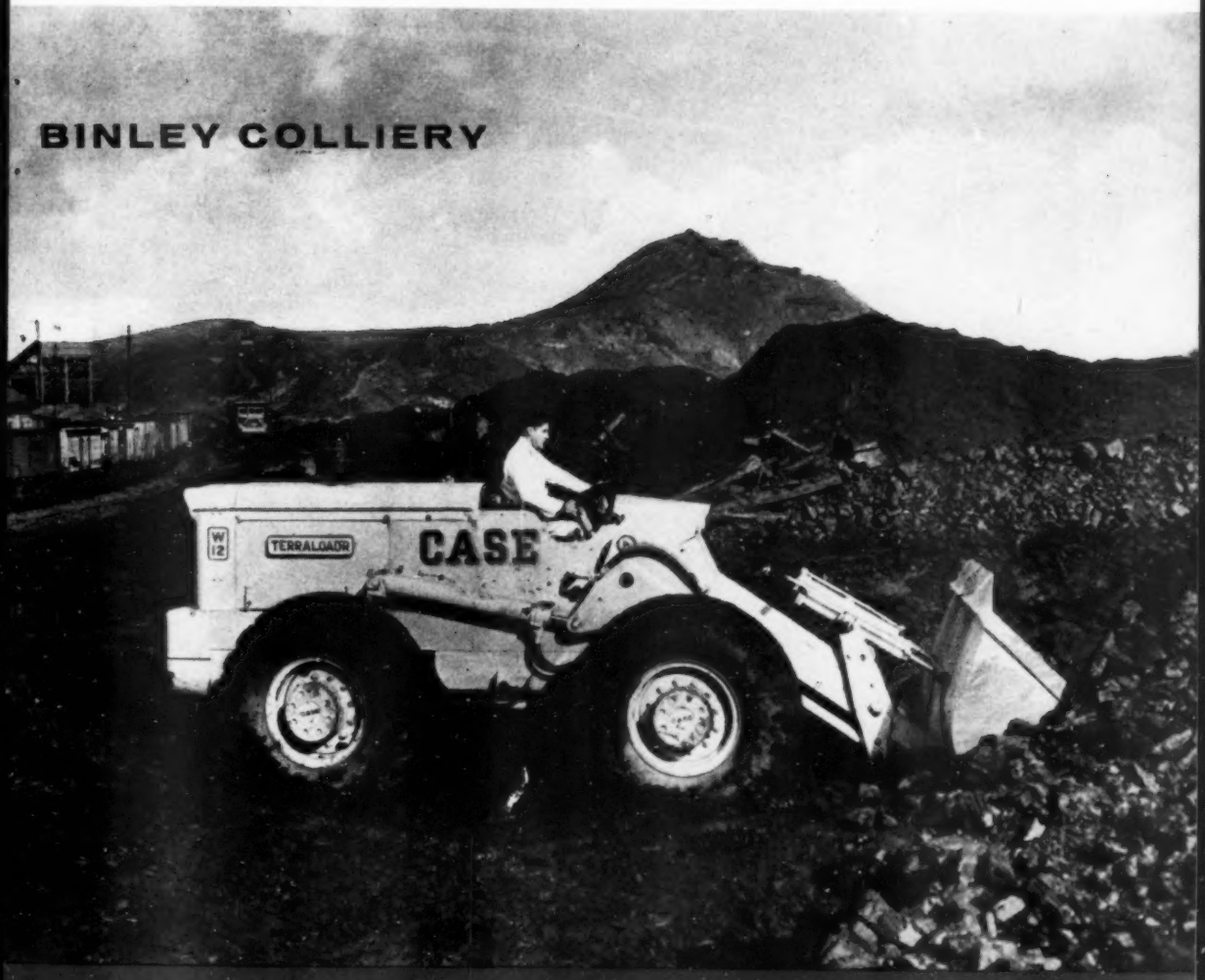

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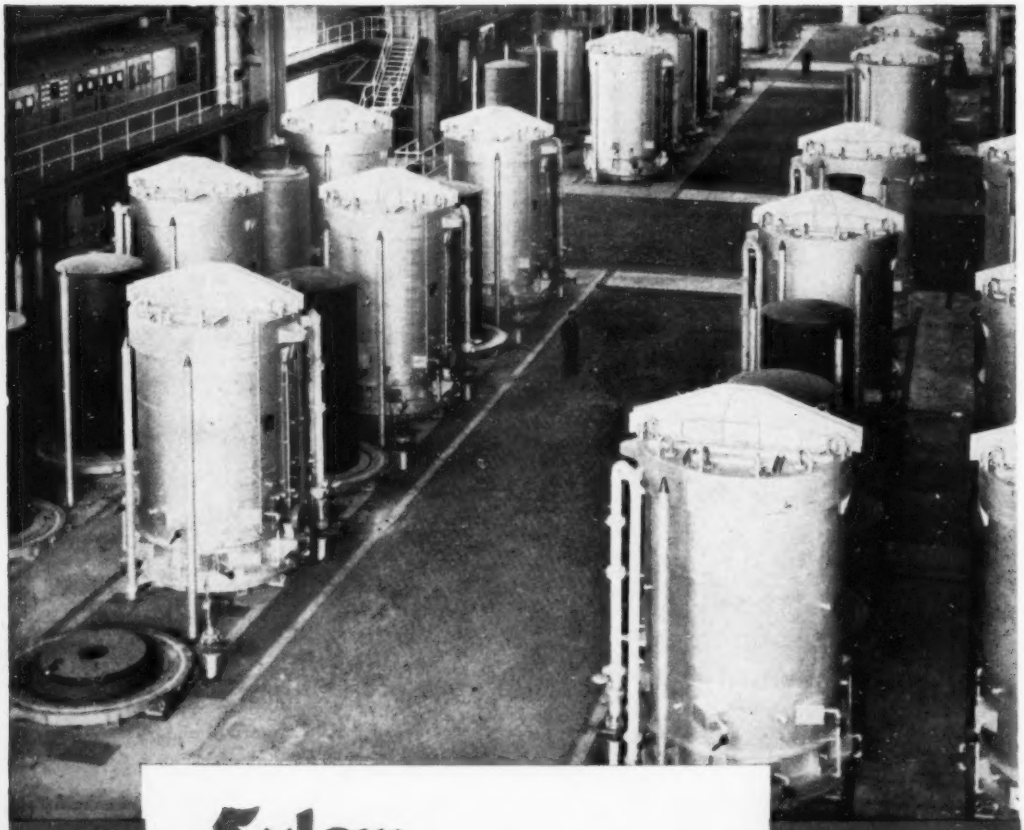

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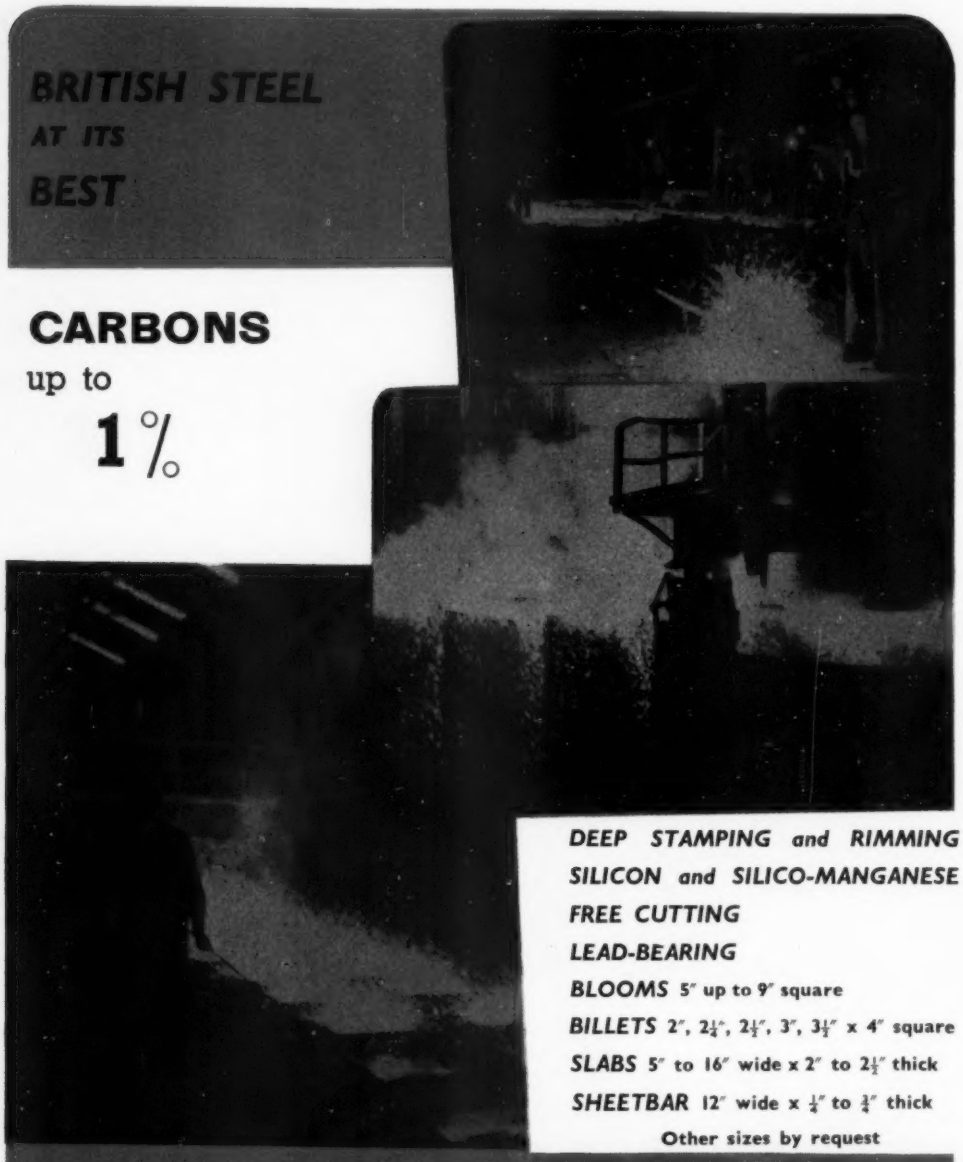

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Vol. 183
No. 4856

IRON & COAL

THE IRON AND COAL TRADES' REVIEW

AUGUST 11, 1961

ESTABLISHED 1866
Incorporating "STEEL and IRON" and "COAL"

Organ of the National Association of Colliery Managers and the Association of Colliery Managers in India

Published each Friday

Annual Subscriptions: United Kingdom....52s. Abroad....60s. Payable in advance.

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Published by
INDUSTRIAL NEWSPAPERS (FUEL & METALLURGICAL), LTD.

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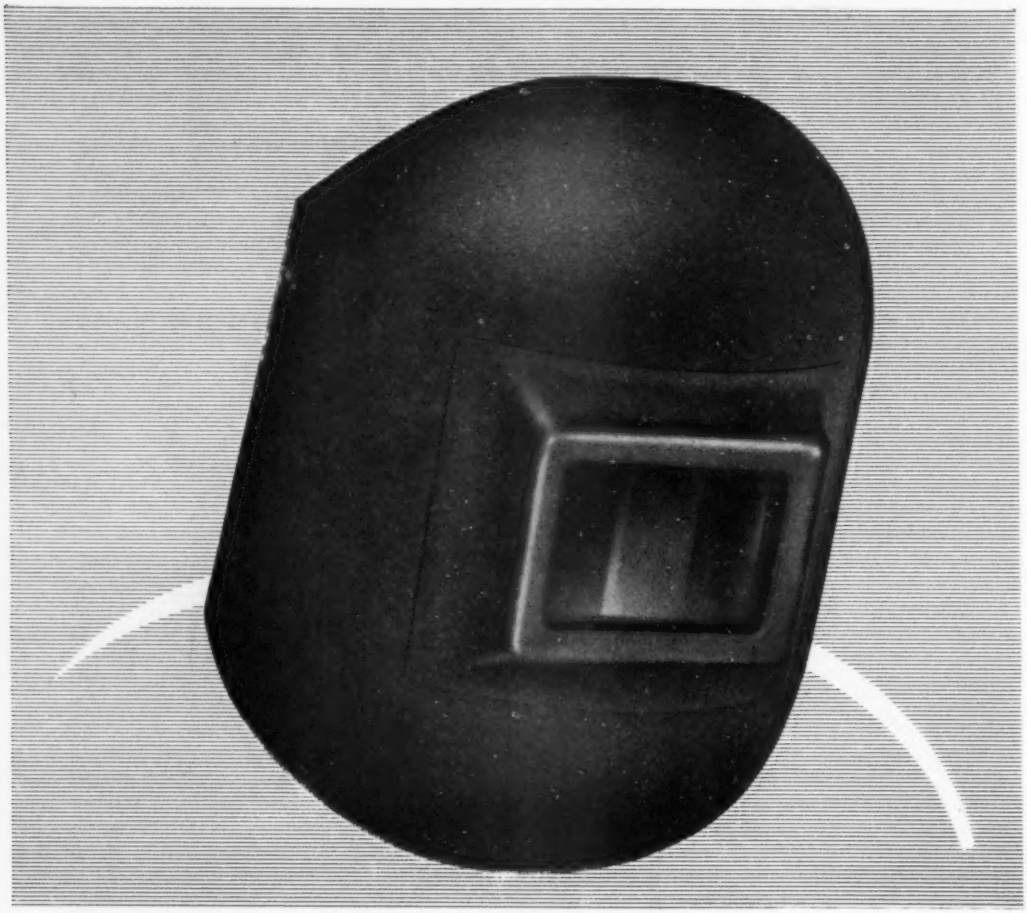

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IRON & COAL
THE IRON AND COAL TRADES REVIEW

Vol. 183 August 11, 1961 No. 4,856

Another Look at African Ore

BRITAIN'S dependence on imported ore is by no means a recent phenomenon. While it has grown with the years, particularly following the late war, British steelmakers have to some extent switched to other suppliers. At the outbreak of World War I Spain and North Africa headed the list, followed by Sweden, who sent only small shipments. In 1960, Sweden topped the list, being followed by North Africa, Canada and Newfoundland, Brazil and Venezuela, and West Africa. In 1913, North Africa contributed 14.3 per cent. of the total supplies imported. By 1960, the percentage advanced to 20.3 out of a much larger tonnage. Adding supplies from West Africa, the figure reached 29.5 per cent. out of some 18,000,000 tons—quite a significant part of the total.

In 1959, Britain took over 70 per cent. of Algerian shipments, the greater part of which came from the Ouenza and Bon-khadra mines (Société de l'Ouenza). In Tunis, Société du Djebel —Djerissa accounts for over 90 per cent. of local production, the greater part of which is shipped to the United Kingdom. About 12 mines operate in Morocco, the largest of which is exploited by Cia Española Dos Minas de Rif. Contemporary developments include the exploitation of the Fort Gouraud concession in Mauritania by Société des Mines de Fer de Mauretanie, which is expected to yield up to 6,000,000 tons per annum. Some 400 miles to the north-east lies the valuable area of Gara Djebilet, near Tindorf, within the administrative area of the Organization of the Sahara Region. Reserves of ore totalling 3,000,000,000 tons are available, 650,000 tons at least containing 57 per cent. iron. A very considerable concession has been granted to SERMI (controlled by Bureau d'Investissement en Afrique). Exploitation will have to await the construction of a railway some 250 miles to the coast, via Morocco or the Spanish Sahara.

The difficulty with both these areas is that they are in some quarters stated to lie within the political aspirations of Morocco. In fact, Mauritania is a newly constituted sovereign state, and Tindorf lies within the OCRS in spite of the fact that the Algerian rebel "Government" (FLM) denies its existence. It is unlikely, however, that rival claims will retard the progress of developments, as foreign exchange that may be acquired through the aid of Western capital is vital to the advancement of the region.

The boundaries of North Africa may remain fluid for some years to come following the removal of Colonial status, but mergers of conterminous territories are unlikely to occur until nationalism abates in the region and economic integration begins to spread.

Extensive developments at Marampa, in Sierra Leone, have been worked since 1933 by the Sierra Leone Development Company, Limited. Development of another large deposit at Tonkolili, a further 73 miles inland from Marampa, is being considered. In the neighbouring territory of Liberia, which has been a traditional focus for US capital, much work is in progress. Production continues at Bomi Hills, some 45 miles from Monrovia, by the Liberian Mining Company, Limited. The National Iron Company, Limited, expects to ship 5,000,000 tons per annum from its Mano River Concessions within two years. West German interests, the Deutsche-Liberische Minen (DELIMCO), are constructing facilities in the Bong range and expect an annual output of 5,000,000 tons in 1963-4. The most substantial new venture is that of LAMCO in the Nimba range, bordering on Guinea and some 180 miles from the coast. Between 5,000,000 and 6,000,000 tons per annum is forecast for 1963-4, rising thereafter to between 10,000,000 and 15,000,000 tons, of which a quarter may be shipped to Bethlehem Steel and the greater part of the remainder to West German steel interests under long-term arrangements.

In the neighbouring state of Guinea, Cie Minière de Conakry's productive capacity approximates 1,200,000 tons per annum. Developments are, however, proceeding in the Nimba and Simand-ougou mountains, with a grant of a concession to Consafrique.

Both Bethlehem Steel and US Steel are interested in mining in Garbon. The former is associated with a European consortium in the Mekambo project, Société des Mines de Fer de Mekambo. The latter is associated with European interests in exploiting the big manganese deposits of Franceville, reputed to be one of the largest in the world.

Further to the south, developments are pending in one of the UK dependencies closely linked to the economy of the Republic of South Africa. Some 40,000,000 tons of ore located at Bomvu Ridge, Swaziland, containing 60.2 per cent. iron and available for open-cast working, has attracted the attention of British interests. Swaziland Iron Ore Development Company holds the mining rights, and developments is to be undertaken by

the Anglo-American Corporation of South Africa and Guest, Keen & Nettlefolds of the UK. Potential buyers are Japanese steel interests, which are hoping to secure 1,000,000 tons per annum on long-term contract after 1964. The territory is enclosed by Union and Portuguese lands, thus necessitating the construction of a rail link from the mine to Goba in Portuguese East Africa and thence overland to Lourenço Marques on the eastern seaboard.

On the East Coast of Africa little development is in prospect. Liganga Iron, Limited, of Tanganyika, suggests reserves of 44,000,000 tons or more with a 46.6 per cent. iron content, but is reluctant to undertake further investigations until the market improves and rail facilities have been constructed to open up local coalfields.

The following shows how interest is divided in the ore-mining enterprises mentioned:—

Société des Mines de Fer de Mauretanie (MIFERMA)—British 20 per cent., Italian 15 per cent., West German 10 per cent., balance French.

SERMI—Bureau d'Investissement en Afrique has the controlling interest.

Sierra Leone Development Company, Limited—Northern Mercantile & Investment Corporation, Limited, 47½ per cent., William Baird & Company, Limited, 47½ per cent., United Africa Company, Limited, 5 per cent.

Liberia Mining Company, Limited—Republic Steel Corporation has the major interest.

LAMCO joint venture—Bethlehem Steel Corporation has a 25 per cent. interest. Remainder is held by the Liberian American Swedish Minerals Company, divided between the Liberian Government (LAMCO) 50 per cent., and Liberian Iron Ore, Limited (LIO), 50 per cent. Of the LIO share, private US and Liberian interests hold 40 per cent. and the Swedish Lamco Syndicate 60 per cent., the latter being divided between the Grängesberg Company (7), Atlas Copco, Norströms, Limbamor (9), and Skänska Cement, Ifdverkem and Sentab (2).

Cie Minière de Conakry—French State authorities 41.3 per cent., BISC (Ore), Limited, 30.5 per cent., Rothschild group 10 per cent., Hoesch, A.G., 5 per cent., balance miscellaneous.

CONSAFRIQUE includes the Banque de l'Indochine, Deutsche Bank, and Hambros Bank.

Société de Mines de Fer de Mekambo (MEKAMBO)—Bethlehem Steel 50 per cent. (US), Bureau Minière 12 per cent. (French), Banque de Paris et des Pays-Bas 5 per cent. (French), Cofimer 3 per cent. (French), five French steel companies 9 per cent., Ruhr Steel Consortium 10 per cent. (West Germany), Fiat 3½ per cent. (Italian), Belgian 2 per cent., Netherlands 0.5 per cent.

Cie Minière de L'Ogue—United States Steel Corporation 49 per cent., Cie. Minière de L'Oubamgui Orienam, Mokta el Hadid, and Bureau Minière de la France d'Outre Mer 51 per cent.

Swaziland Iron Ore Development Company, Limited—Private company shareholders, Anglo-American Corporation of South Africa, Limited, and Guest, Keen & Nettlefolds.

Liganga Iron, Limited—Colonial Development Corporation, Ventures, Limited, Anglo-American Corporation of South Africa, Limited, Tanganyika Government.

Short-time Warning by Appleby-Frodingham

UNLESS demand for steel revives, short-time working may become necessary in the next few weeks at the Appleby-Frodingham Steel Company, branch of the United Steel Companies, Limited. Issuing this warning to the 11,000 men employed there, Mr. G. D. Elliott, general works manager of Appleby-Frodingham, said last Friday that the works was in for a more difficult time than it had faced for many years. There was a possibility of production slowing down at the Frodingham section mills later this month, with probable short-time working elsewhere in the works.

Since June, when it was stated that the company "might have to start living with a shorter order-book," the downward trend in the volume of orders had continued. Because of the general depression in the steel industry, the company's associates in Sheffield would almost certainly need fewer ingots from Appleby-Frodingham, which might result in the company having a large surplus ingot capacity for some time to come. The company's plate mills, the official said, could be kept fully occupied until late September, but the recession must have repercussions on iron and coke making.

The announcement was made on the 11th day of the strike of 3,000 maintenance engineers at the three main Scunthorpe steelworks, Appleby-Frodingham, the Redbourn works of Richard Thomas & Baldwins, Limited, and Lysaght's Scunthorpe Works, branch of the G.K.N. Steel Company, Limited. Leaders of the men the same day failed to win acceptance from the employers for a compromise plan to settle the dispute, which is over two-shift working at the Appleby-Frodingham works.

RTB Plans New Ore Ship Terminal at Newport

ACTING on behalf of Richard Thomas & Baldwins, Limited, a firm of marine surveyors has applied to the Ministry of Transport for permission to carry out surveys and investigations regarding a scheme for a deep-water terminal where large ships can unload cargoes of iron ore on the banks of the River Severn between Newport and Goldcliff (Mon), Newport Harbour commissioners were told on Wednesday.

The terminal would be sited in Newport Deep, and the area to be surveyed covers a stretch of coast and water between the East Usk Lighthouse and Goldcliff, immediately below the new Spencer steelworks of RTB at Llanwern.

Steel Output in July

DROP OF 3 PER CENT. ON 1960 FIGURE

PRODUCTION of steel in July, affected as is usual by the holidays, was at an average rate of 380,200 tons a week, compared with 447,500 tons a week in June, states the Iron and Steel Board in its monthly production statement published yesterday (Thursday). The July rate represents a 3 per cent. drop on the comparable figure for last year. Production of pig-iron was at an average of 276,600 tons a week, compared with 297,400 tons a week in June, and 288,900 tons in July, 1960.

The stocks of steel held by users and merchants, the board reports, fell by about 80,000 tons or nearly 2 per cent. during the second quarter. This estimate is based on the returns which have so far been received in the census taken at the end of June and which cover over half of the total stocks.

There was a further substantial fall in stocks of sheet. Stocks of tinplate also fell, but there was rise in the stocks of plate. Stocks of other types of steel fell by about the average of 2 per cent. over the whole field.

UK Consumption

On the basis of the figures so far available it is estimated that the use of steel in the home market during the second quarter amounted to a seasonally-corrected figure of 3,690,000 tons, practically the same as during the first quarter. Quarterly figures of the use of steel in the home market during the past few years show considerable fluctuations over the past four and a half years.

Estimated actual UK consumption in the first quarter of 1957 was 3,492,000 tons (seasonally corrected, 3,370,000 tons), and this improved the following year by 0.9 per cent., dropped by 11.5 per cent. in 1959, soared by 21.6 per cent. last year, but only made 1.4 per cent. headway this year. The second quarter's figures for 1957—3,427,000 (3,330,000) tons—made no improvement until last year when they were 14.9 per cent. better. This year they flagged by 2.1 per cent. Similar variations are shown in the figures for the third and fourth quarters.

Latest pig-iron and steel output figures (in tons), with the corresponding 1960 returns, are shown in the following table:—

Period.	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
1961—May ..	300,200	15,610,000	466,100	24,240,000
June ..	297,400	15,463,000	447,500	23,268,000
July	276,600	14,381,000	380,200	19,771,000
1st 7 months	301,400	15,671,000	457,900	23,811,000
1960—May ..	299,100	15,554,000	475,400	24,723,000
June ..	299,200	15,353,000	466,400	24,255,000
July	288,900	15,024,000	391,400	20,355,000
1st 7 months	300,900	15,649,000	465,100	24,183,000

AN EARLY ANNOUNCEMENT is expected of the decision of the Dominion Steel & Coal Corporation, Limited (a subsidiary of A. V. Roe, Canada, Limited), to construct a steel-producing plant at Contrecoeur, Quebec Province.

Vacuum Melting Furnace for English Steel

VACUUM melting furnace of the consumable arc type is to be installed by the English Steel Corporation, Limited, Sheffield. It will be capable of producing ingots of up to two tons. English Steel is the latest among leading Sheffield special steelmakers who have now taken to vacuum melting. Both Thos. Firth & John Brown, Limited, and Hadfields, Limited, are due to have vacuum melting plants in operation this autumn.

Jessop-Saville, Limited, which pioneered the field in Sheffield, is now adding a 1-ton vacuum induction furnace to its other consumable arc and induction units, and a smaller Sheffield firm which has such units is G. L. Willan, Limited.

Expansion by Firth Brown Tools

CAPITAL commitments of Firth Brown Tools, Limited, Sheffield, a subsidiary of John Brown & Company, Limited, in the year ended March 31, 1961, totalled £458,000 (£34,000). This is the result of the company undertaking a considerable programme of works improvement and expansion in which all possible operating economies likely to save cost or delivery time have been sought, Mr. E. Mensforth, the chairman, told shareholders in his annual statement.

John Brown, holders of all the issued ordinary capital, has already intimated that it wishes to subscribe for the balance of the ordinary capital which was unissued at the time of the financial year end, which will give £400,000 towards financing the expansion programme. Furthermore, the authorized capital has recently been increased to £3,000,000 by the creation of 500,000 ordinary £1 shares.

Record Output Achieved at Durgapur Steelworks

ALTHOUGH its rated capacity is only 1,250 tons daily, No. 2 blast furnace at the Durgapur steelworks, India, achieved a record output of 1,578 tons of iron in the 24 hours ending 6 a.m., July 31.

The blast furnaces were built by Head, Wrightson & Company, Limited, a member company of ISCON, the British consortium constructing the £210,000,000 steelworks at West Bengal.

Passing Thoughts . . .

SIR WILLIAM MCFADZEAN

I SUGGEST to condemn an industry wholesale and even more so British industry in general is both unfair and detrimental to our export effort. . . . After all anyone is inclined to buy from a shop, a company, or a country in which they have the greatest confidence, and the unjustified things being said in this country about British industry as a whole are not only giving another weapon to our competitors overseas, but creating yet another obstacle which the thousands of people in this country who are trying to export have got to overcome.—SIR WILLIAM MCFADZEAN, chairman of the Export Council for Europe and chairman and managing director of British Insulated Callender's Cables, Limited, in a letter to the Financial Times.

The sacrifice of some pleasure is unavoidable if you want to get on. Night school may at first seem a poor substitute for rock 'n' roll and television, but future knowledge by way of evening classes and day release is vital.—MR. W. T. ELLIOTT, *manager of Calverton Colliery, East Midlands Division of the National Coal Board, at a Hucknall school speech day.*

It is utterly wrong to talk of shipbuilding being a dying industry. If the shipbuilding industry is a dying industry so is the haircutting industry and the shoemaking industry, the oil industry, and everything else. —MR. A. C. DRAKE, managing director of British Petroleum, Limited, after the launching of a new tanker.

We are still more concerned with how the cake shall be shared, than with ways and means of increasing its size.—HAROLD WINCOTT, *in the Financial Times.*

The Government's lectures to British industry to be more competitive abroad would carry more force if it had not itself weighted the scales against competitiveness by policies that force up the cost of fuel. The substantial tax on fuel oil . . . may give some measure of protection to coal, but it is a deliberate addition to manufacturing costs in all oil-using industries. Moreover, it relieves the coal industry of any sense of urgency about the need to bring down coal prices.—The Guardian.

We do not consider that our duty to those 12,000 *people who serve us so well ceases with the handing over of a wage packet.*—SIR CHARLES WESTLAKE, *chairman of Metal Industries, Limited.*

It [membership of the Common Market] will make wild-cat strikes, demarcation disputes, shorter hours without an increase in productivity impossible luxuries. The results are going to affect the workers even more than the employers.—LORD CHANDOS, chairman of Associated Electrical Industries, Limited, speaking in the debate in the House of Lords.

Money and work are still the ingredients of the daily existence of energetic men and women in preference to amusement or a round of frivolity and expenditure with nothing to show when it is ended. The unions have not entirely succeeded in enforcing idleness or a longer holiday on the many who are individualists, with an intense dislike to being told what to do with their time.—Letter in the Financial Times.

Even Sheffield's export trade is being hit by the Bingo craze. A Sheffield firm which is exporting to the Continent and which packs its goods in attractive cardboard boxes is having difficulty in getting the cardboard as so much of it is being used for Bingo cards.—ALD. A. V. WOLSTENHOLME, former Lord Mayor of Sheffield.

IME Associate Membership Examination

IN the Associate Membership examination of the Institution of Mining Engineers, held in May, the following candidates were successful. Those marked with an asterisk received passes, subject to passing in mining legislation at the first class certificate of competency examinations of the Mining Qualifications Board:

H. Adamson, D. Andrew,* F. Baker, G. Beetham, H. B. Bennett, E. J. Bevan, A. K. Bhattacharyya, M. D. Bradford, T. J. Charlesworth, P. D. Colley, D. Davies, J. D. Flack, J. Foxall,* G. F. Froggatt, A. J. George,* G. Gillatt, T. Glover, P. G. Gokhale, J. W. G. Golding, T. Griggs.

D. D. Hackett, J. Haggis, J. F. G. Hall, K. B. Harris, G. J. Hartshorn, J. L. Hepburn, D. Hobson, D. V. Humphris,* J. G. Illsley, A. T. Johnson, A. Jones, T. F. A. Khan, D. R. Lewis,* C. W. Lowe, I. C. McGregor, D. M. McKillop, T. H. F. Malkin, T. Malley, E. Marsh, J. J. Mason,* D. A. Mitcheson-Lee, K. Moses, L. H. Moules, T. J. Nash, H. L. Nelson, J. T. O'Brien, G. M. Omezi, J. N. Pilch, R. Skeldon, G. M. Smith,* W. J. Smith, D. Stephenson, P. H. Ward, T. E. Wheatley, J. H. White, J. C. B. Wilson,* W. M. Wilson, G. I. Windfield.

The following candidates, previously referred in mining legislation, have now passed: S. K. Ghosh, S. S. Jha, R. Mullins, M. F. Pleming, M. A. H. Price, K. C. B. Stobart, S. P. Varma, C. B. Williams.

The next examinations will be held jointly with those of the Mining Qualifications Board on November 14, 15, and 16, 1961, at the following centres:—Cardiff, Doncaster, Glasgow, Stoke-on-Trent, Sunderland, and Wigan. Forms of application and full particulars may be obtained from the Secretary, 3 Grosvenor Crescent, London, S.W.1. Last date for acceptance of entries, September 21, 1961.

At its meeting on July 19, this year, the Council of the Institution decided that, in future, candidates holding an approved degree or diploma should be given exemption from the papers in principles of mining in the final examination for associate membership.

Such candidates entering in November, 1961, and thereafter will therefore be required to satisfy the examiners in the paper on organization and management only. Those who do not hold a first class certificate of competency must also pass the paper in mining legislation set by the Mining Qualifications Board in their examination for the first class certificate.

This alterations of rules does not apply to candidates in the May, 1961, or earlier examinations.

New Coal Plant

WILL HANDLE OUTPUT AT THREE STAFFORDSHIRE PITS

NEW £1,500,000 coal preparation plant, the largest in the West Midlands, for handling the combined output of three North Staffordshire collieries, is expected to be in operation soon at Wolstanton. The plant, together with the deepest new pit shaft in the country, will be in use after the miners' annual holiday. Both are part of a £10,000,000 concentration scheme which is expected to raise the combined output of Wolstanton, Deep Pit, and Sneyd collieries from the 858,000 tons in 1960 to 1,250,000 tons by 1962-63.

A spokesman for the West Midlands Divisional Coal Board said that the main purposes of the concentration scheme were to modernize the transport systems of the three collieries and to provide means of working large reserves in the deeper seams. These seams had been touched in the past, but ventilation and other problems caused them to be abandoned.

The new No. 3 Wolstanton shaft, a concrete tube of 24 ft. dia. is 3,417 ft. deep and has taken just over four years to sink and equip. The No. 2 upcast shaft, enlarged to 24 ft. dia., has been deepened to 3,434 ft. and should be back in use by the end of this year.

Link With Steelworks

A feature of the whole scheme is a conveyer belt link between the preparation plant and the Etruria works of Shelton Iron & Steel Company, Limited, on the opposite side of the main railway line. Blended carbonizing coal will be fed to the works direct from the colliery bunkers. This is the second direct link in the West Midlands between a Coal Board plant and a consumer, the other being at the new Lea Hall, Cannock Chase, colliery, where there is a conveyor supply to the adjoining power station.

The plant can handle 720 tons an hour in two streams—carbonizing coal and non-carbonizing for the industrial and domestic markets. Both groups will be treated at the same time in a dense medium separating vessel, the first of its type in this country, and will be kept apart by a dividing plate. The plant has 220 electric motors, totalling 4,500 h.p., and its seven booms for loading rail wagons will be the first in North Staffordshire to be fitted with electric probes for automatic adjustment of the loading heights. It will prepare 13 grades of coals and 21 bunkers will help to maintain quality. The new landsale will have bunkerage for 500 tons of carbonizing coals and 300 tons of other grades.

The extensive modern surface installations at Wolstanton have provided an impressive new landmark for some time. The tower housing two four-rope friction winders of 3,300 h.p. rises 174 ft. above the new shaft. Each winder will operate a cage carrying eight 2½-ton capacity mine cars, balanced by a counterweight. The tower stands on four 10-ft. dia. concrete legs sunk into the ground and belling out at the base to about 20 ft. dia.

No. 2 shaft has a similar tower-mounted friction winder and one four-deck cage with a counterweight. It will be used for winding men and stone, and stowing dirt and materials. Compressed air for underground stowing operations and other purposes will be provided by a battery of compressors, each of 6,000 cu. ft. per. min. capacity. Surface plant will be all-electric, except for space heating, and a new sub-station and transformer compound have been built for the grid supply at 33,000 v.

Underground, the concentration scheme has involved constructing the first locomotive haulage horizon at a depth of 615 yds., just above the present winding level. Seams in the upper levels of the Wolstanton "take"—Peacock, Great Row, and Cannel Row—will be developed by semi-horizon methods, and the full horizon system will be used when the second horizon is constructed.

Deep pit workings are already connected to a haulage horizon driven at a depth of 1,000 yds. from the new shaft, and the link with the Sneyd workings should be completed by early next year.

Another feature of the scheme is that there will be no dirt mound at Wolstanton. All dirt and rejected material from the cleaning processes will pass through a preparation plant and be returned undergound for stowing.

Investigation into Third Lurgi Gas Plant

JOINT study group from the National Coal Board and the Gas Council, which has been looking into gas-making developments, has recommended an investigation into the possibility of building Britain's third and largest Lurgi gasification plant in the East Midlands area. Three contractors have been asked to prepare designs, giving costs and layout based on a plant needing 1,000,000 tons of coal a year and capable of producing more than 109,000,000 cu. ft. of gas a day, a rate which would make it the biggest gasworks in the country.

Sites in Leicestershire, Nottinghamshire, and Derbyshire are being considered and initial approaches have been made to local authorities for planning permission and essential services. The contractors who are undertaking the work are Humphreys & Glasgow, Limited, the main contractors at the first Lurgi gasification plant to be built in Britain—at Westfield (Fife)—and who have already done some initial work at the Desford site; Woodall-Duckham Construction Company, Limited, which is working on the second Lurgi plant to be constructed, at Coleshill, near Birmingham; and Constructors, John Brown, Limited.

According to the current issue of Coal News, the sites to be investigated are near Desford (Leics), Newstead and Moor Green (Notts), and Langwith (Derbyshire) collieries. By using new techniques it is hoped that the cost would be lower than the 8.95d. per therm estimated two years ago.

Personal

Hon. Treasurer of Iron and Steel Institute

GENERAL managing director and deputy chairman of G.K.N. Steel Company, Limited, Mr. H. W. A. WARING has been elected honorary treasurer of the Iron and Steel Institute in succession to Sir Julian Pode, deputy chairman and managing director of the Steel Company of Wales, Limited. Sir Julian has been elected a vice-president of the Institute.

MR. H. W. A. WARING

Mr. Waring represented the Ministry of Economic Warfare in the wartime discussions with Sweden which finally resulted in the closing of the ball-bearing traffic to Germany. After the war he was for two years in the Control Commission for Germany and was successively in charge of iron and steel, basic industries, and in 1947 became deputy chief of the industrial division.

After four years as secretary of Guest Keen Baldwins Iron & Steel Company, Limited (now GKN Steel Company), he joined the UN Economic Commission for Europe in 1951 and became head of the industrial division. He has been chairman of the division's steel committee for the past three years. He returned to private business in 1956, when he became managing director of Brymbo Steel Works, Limited.

The Council of the Institute is to nominate Mr. M. A. FIENNES, chairman-designate of Davy-Ashmore, Limited, and chairman of Davy & United Engineering Company, Limited, at the institute's autumn meeting on November 2, for election at the annual meeting on May 2, 1962, as president for 1962-63.

Air Marshal Sir COLIN W. WEEDON has resigned from his executive duties as director and general manager, commercial sales, of the aero engine division of Rolls-Royce, Limited, but will continue as a senior aero engine division representative.

Mr. DONALD B. HIRSCH is to join the oversea division of Monsanto Chemical Company, Limited, on September 1, as manager of economic planning for Europe. He will be located at St. Louis until January, 1962, after which he will make his headquarters in Geneva, Switzerland.

A member of the Institute of Fuel for many years, Mr. W. P. C. UNGOED, chief power plant engineer in the steel division of the Steel Company of Wales, Limited, has been made a Fellow of the Institute. He was elected chairman of the South Wales section of the institute just over a year ago.

Chairman and managing director of Crossley Bros., Limited, Manchester, Mr. H. DESMOND CARTER has been appointed chairman of the British Internal Combustion Engine Manufacturers' Association in succession to Mr. L. P. Lee for the coming year. Mr. C. F. BARNARD, executive vice-chairman of Mirrlees Bickerton & Day, Limited, has been appointed vice-chairman of the association.

General manager of the Tyne Improvement Commission, Newcastle-upon-Tyne, Mr. W. GRAY BROWN has retired. He joined the authority 49 years ago as office boy, became assistant general manager in 1941, and general manager in 1946. His successor, Mr. A. J. CLARKSON, joined the Commission in 1939 as traffic manager at Tyne Dock, Albert Edward Dock, and Northumberland Dock. New assistant general manager is Mr. JOHN WILLIAMSON, formerly an assistant to the general manager.

Nottingham City magistrate, Mr. E. T. AVERILL, whose record of public service is exceeded only by his 52 years at Chatterley-Whitfield Colliery retired last week. Mr. Averill, who was transferred to the administrative staff of the colliery 10 years ago, started work as a boy in the blacksmith's shop and was paid 5s. for a 62-hour week. His interest in the trade union movement goes back 50 years and for 26 years he was president of the local branch of the National Union of Enginemen, Firemen, and Electrical Workers.

Chairman of the Asquith Machine Tool Corporation, Limited, Halifax (Yorks), Mr. ROBERT W. ASQUITH was married on Tuesday while on holiday in Majorca. His bride, Miss Deirdre Newton Woof, is the daughter of Mr. T. N. Woof, a director of the tools division of the Birmingham Small Arms Company, Limited. Mr. Asquith is the first English president of the European Committee for Co-operation of the Machine Tool Industry and was one of the founders of the Muscovite Society, which encourages trade between this country and Russia.

Industrial Relation Changes in South-Western NCB

GENERAL manager of the No. 1 (Swansea) Area since 1955, Mr. John Gregory Tait has been appointed industrial relations director of the South-Western Divisional Coal Board. He succeeds Mr. Gomer Evans, who retires at the end of the month. Mr. David R. Llewellyn, No. 9 (Neath) Area industrial relations officer, has been appointed deputy director of industrial relations, South-Western Division, in succession to Mr. T. Lewis, who retired at the end of May.

Educated at Wellingborough College, Mr. Tait took up an apprenticeship with Metropolitan-Vickers Electrical Company, Limited, while continuing his studies and gained a London University B.Sc. (external) degree with honours in engineering.

Joining the Grassmoor Company, Limited, in 1934, he gained technical and administrative experience in connection with collieries and coke ovens. He was appointed secretary to the company in 1936 and in 1940 became its assistant general manager, holding this post until nationalization, when he was appointed administrative officer of the No. 3 (Edwinstowe) Area of the East Midlands Divisional Coal Board.

A native of Glamorgan, Mr. Llewellyn worked at Fraldau and International Collieries and was an active member in the miners' trade union, serving on the executive council of the South Wales Miners Federation and more recently on the executive of the National Union of Mineworkers. He became industrial relations officer for the No. 9 (Neath) Area in June, 1957. He has extensive experience of industrial relations problems and was a member of the Disputes Committee of the Conciliation Board in South Wales. He was also actively associated with the former Miners Welfare movement and latterly with the Coal Industry Social Welfare Organization.

TRAINING TECHNICIANS

Recognition as Distinct Grade Needed

CLEAR recognition of a technician grade in the steel industry with its own standards and training requirements distinct, on the one hand, from operatives and craftsmen, and on the other from technologists, is urged in a report on the Recruitment and Training of Technicians drawn up by the British Iron and Steel Federation. The report, which says that a technical qualification should in future be regarded as essential for all technicians, makes recommendations on their recruitment, training, and further education.

The report, compiled by the Federation's training committee, points out that while the number of technicians employed in the steel industry is increasing, they are not always recognized as such, and it is important that their standards of recruitment, training, and education should be established.

Comprising an extremely wide range of people within the industry, including maintenance foremen, first-hand melters, draughtsmen, and technologists' assistants, identification of the technician is made difficult says the report, which suggests that the term "technician" should where possible be incorporated in the titles of jobs at technician level, and that professional titles such as "engineer," "metallurgist," or "chemist" should be confined to posts at technologist level.

Wasteful Recruiting

New techniques and plant in production departments make it essential that senior operatives should have technical ability and qualifications at technician level, says the report. In laboratory and quality control departments people engaged in simple and repetitive work are sometimes described as technicians and an analysis of their actual responsibilities is needed.

The success of any scheme for training depends primarily on the selection of suitable recruits, the report stresses. Recruiting technicians at a late stage from the unsuccessful products of other training schemes, such as those for technologists, can be wasteful and unsatisfactory. A primary factor in selection must be the ability to undertake successfully courses for the technical qualifications required by the job.

While for the higher levels of technician National Certificate Courses will continue to be appropriate, the majority require a course which is designed specifically for their needs and is closely geared to industrial requirements, and as indicated in the White Paper "Better Opportunities in Technical Education," a number of new or supplementary courses is needed.

The technical education needs of various groups of technicians in laboratory and quality control departments should be examined in order to establish suitable courses, and a similar investigation should be made of the needs of those whose work has a mathematical basis. Although some suitable courses are already provided for engineering technicians, a re-examination of this field is also desirable.

Technological changes in the industry and the desirability of continuing the promotion of process workers make it necessary to establish suitable national courses for senior operatives, and the undertaking of such advanced courses should ultimately become an essential qualification for promotion to the more responsible operative jobs. For an interim period, older men should be given facilities for taking the courses without necessarily sitting the examinations.

For some courses of a specialized nature, says the report, block release may be necessary and may be more convenient than part-time day release. Technical colleges may need help from the industry in the release of staff to act as instructors.

Because of the specialized nature of much technician education, transfers from one stream to another will become more difficult, particularly if attempted at a late stage of training, and careful initial selection and flexibility in the early stages is urged. Rotation of jobs in various departments, says the report, will help the trainee to relate his job to the whole process. Technical education and practical training should be correlated, and traditional methods of training engineering technicians reviewed.

Foremen need technical qualifications equivalent to those of the senior men they have to supervise, the report notes, and should be recruited from a wider range of people, including technologists in training, than have been considered in the past. Existing or prospective foremen should be given facilities to acquire technical qualifications.

Higher Output by John Thompson

OUTPUT for the first six months of the current year by John Thompson, Limited, steam power plant manufacturers and general engineers, of Wolverhampton, represented an increase of 14 per cent. over the corresponding period for 1960, Sir Edward Thompson, chairman, told the annual meeting. Orders received for the past six months showed an increase of 15 per cent. over the corresponding period for 1960, and 47 per cent. over the same period in 1959. Orders on hand now totalled £39,000,000.

The chairman said that there had been a modest increase in the profit margins of recent orders received by some of the group companies. Due to the difficult position in water tube boiler contracting, the group could not expect to see profits on the peak scale of 1956 and 1957 from this sector at least for some years ahead. With developments and improvements in other companies in the group, however, he was hopeful that profits for 1961 would not be less than those for 1959. Given reasonable trading conditions, there was every prospect that the group might be able to resume payments of ordinary dividends for 1961, possibly with an interim dividend payable on November 1 next.

Orders Placed

Power Station Contracts

IN connection with the North of Scotland Hydro-Electric Board's £24,500,000 Loch Awe scheme, orders, stated to be worth several million pounds, have been placed with the English Electric Company, Limited, and Associated Electrical Industries, Limited. The equipment for this scheme, which is claimed to be the largest in the world, is the first of its kind to be manufactured in this country.

The orders call for the manufacture and installation of the large pumping and generating plant required for the Cruachan pumped storage power station. This station will be situated underground in the heart of Ben Cruachan and is the major one of the Loch Awe scheme. There are two conventional hydro-electric stations at Inverawe and Nant. The pump-turbines are sub-contracted to Boving & Company, Limited, London, W.C.2.

ORDERED FROM Ruston & Hornsby, Limited, Lincoln, 14 diesel electric locomotives will replace 18 steam shunting engines at Southampton Docks where steam engines have been in use since 1872.

CONTRACT WORTH £500,000 for 862 semi-trailers and over 300 tractors with automatic coupling gear, has been placed with Scammell Lorries, Limited, Watford (Herts), by British Railways.

ON BEHALF OF Taylor Bros. & Company, Limited, Manchester, De Jersey & Company (Finland), Limited, has secured a £361,000 order for the supply of solid steel railway wheels for the Finnish State Railways.

AN ORDER FOR 2,000,000 ft. of speedometer flexible cable from the German instrument firm, V.D.O., has been received by Smiths Motor Accessories, Limited, London, N.W.2. A fire recently at one of V.D.O.'s factories interrupted its manufacture of flexible cables.

CONTRACTS WORTH £510,000 for the supply of steel and spun iron water pipes have been awarded jointly to Stewarts and Lloyds, Limited, and the Stanton Ironworks Company, Limited. The orders are from the Trinidad Works Department Supplementary Water Scheme.

THE BRITISH FIRM of Boving & Company, Limited, has been awarded a contract to supply eight 130,000 h.p. turbines for the Murray Power Station, the largest in Australia's Snowy Mountain hydro-electric scheme. Work on the Murray power station is expected to begin in November.

CONTRACT has been awarded by the Central Electricity Generating Board to William Boby & Company, Limited, water treatment engineers, for the installation of a fully automatic demineralization plant at the Bankside power station. It will have a capacity of 8,000 gall. of feedwater per hour.

CONTRACT worth over £250,000 for the manufacture, supply, and installation of a rotary kiln for the Oxfordshire works of Chinnor Cement & Lime Company, Limited, has been awarded to Vickers-Armstrong (Engineers), Limited. The kiln will replace a smaller unit which has been in service for 30 years.

ORDER FOR two shaker hearth furnaces has been received by the Incandescent Heat Company, Limited, Smethwick, from Cooper & Turner, Limited, Sheffield. One will be used for normalizing rivets and the other for hardening bolts that are direct quenched from the shaker hearth. Both furnaces are gas-oil fired, using the new RIMPA high duty burners.

FOR A COPPER mine 8,000 ft. up on the western slopes of the Andes, in Chile, British Ropes, Limited, Doncaster, has supplied 56,600 ft. of wire rope to renew the mine's bi-cable ropeway which takes concentrates to the smelter. It is four miles long with two spans, one 2,500 ft. and the other 2,000 ft. British Ropes has also supplied 3,500 ft. of 1¾ in. diameter tramway track cable; 3,000 ft. of 1¼ in. diameter cable of the same type; and three lengths, each 16,700 ft., of 1 in. diameter traction cable.

CJB Wins £2,000,000 Contract in Poland

DEVELOPMENT of UK trade with Poland recently took a big step forward with the signing of a contract worth nearly £2,000,000 between Polimex, the Polish Government trade organization, and Constructors John Brown, Limited, London, W.2, who, in conjunction with its associates, has already obtained contracts for work in Russia.

Present contract is for the design, supply, and installation of three tonnage oxygen and nitrogen plants, which are to be used in the production of ammonia at Tarnow, in the south of Poland. The plants, to be completed successively within a period of five years, will have a combined output of nearly 1,000 tons a day of oxygen and more than 1,100 tons a day of nitrogen.

The installation will be capable of producing sufficient oxygen and nitrogen for the production of more than 1,000 tons a day of ammonia, or several times that quantity of artificial fertilizers. The air separation process used will be that developed in the US by Hydrocarbon Research Incorporated, which will be closely associated with CJB in the technical aspects of the project.

This is the first contract for the provision of tonnage oxygen plant to an eastern European country which has been secured by a British company, and it has been won against strong competition from well-established suppliers both in the UK and Western Europe.

Wilmer Lea Proposal for Integration

AN integration plan is proposed by Wilmer Lea Foundries (Holdings), Limited, whereby the Charles Karen & Son (Holdings), Limited, group, which control Wilmer Lea, and eight non-trading companies will become wholly-owned subsidiaries. The consideration for the proposed acquisition is £655,000 to be satisfied as to £225,000 by the issue of 600,000 5s. ordinary of Wilmer Lea at 7s. 6d. A balance of £430,000 due to CKS Holdings will be secured by a debenture of which £230,000 will be convertible into 5s. ordinary, subject to consent. Wilmer Lea's present 1s. ordinary are to be consolidated into 5s. shares.

Subject to the integration scheme being carried into effect, Wilmer Lea or otherwise CKS Holdings will acquire the capital of Percy G. Thomas, Limited, tinplate merchants, of Neath (Glam), for £45,000. An extra-ordinary meeting of Wilmer Lea will be held on August 28 to approve the proposals. It is proposed to change the name of the company to C.K.S. Group United Metals, Limited.

Although he has resigned as a director of the Cementation Company, Limited, Mr. A. R. NEELANDS continues as president and remains senior consultant.

In Parliament

COAL FOR POWER INDUSTRIES

Future Problem May be One of Shortage

REPLYING in a debate on the power industries, MR. J. C. GEORGE, Parliamentary Secretary to the Minister of Power, said that the fear today in the coal industry was of a shortage rather than a surplus. The industry did not need a plan to ensure that more coal was consumed, but a plan to produce efficiently more and cheaper coal. This year, if the demand was for 200,000,000 tons, with output not likely to be higher than 190,000,000 tons, there would be a 10,000,000 tons gap to be met from stock, and stocks would not last for ever. If 200,000,000 tons were to be consumed each year, the gap would remain unless an increase in output were achieved.

MR. GEORGE was replying to MR. ALFRED ROBERTS (Lab.), who said it was time the country had a fuel plan which would ensure greater use of coal by the electricity and gas industries. Consumption of oil in the electricity industry was slightly on the increase, he said, and the gas industry was still using a lot of oil.

More co-ordination was needed between the three industries. "The Minister should have the courage to say that we are going to produce gas and that it will be produced from inferior coal, and that we are going to produce electricity and that it must come from coal."

Electricity "A Great Ally"

MR. GEORGE said that neither the gas nor the electricity industries needed to be induced to use more coal. Electricity was already a great ally of the coal industry and would remain so. Last year, 51,000,000 tons were taken by the electricity industry, 5,000,000 tons more than the year before. Already this year 2,200,000 tons more than last year had been consumed, and the rise continued.

The fall in consumption of coal by the gas industry was surprisingly small. Last year it dropped by only 100,000 tons, so that there was no great swing away from coal to oil. The gas industry was expanding, and expected to increase its output by about 25 per cent. in the next 10 years. In that increase, if it came about, there was room for coal at its present level of consumption.

Answering MR. ROBERTS' point that coal exports, which last year reached 5,000,000 tons, could be doubled within the next five years, MR. GEORGE said that it had been made public that the National Coal Board was losing heavily on its exports, and there was a limit to what the board could lose on exports. It was all very well to lose if for a time by doing so one could build up in the future to an economic price, but that was not the evidence.

The opposition in Europe was serious, with Poland prepared to sell at a price which was always less than the British price. Too much confidence should not be shown, therefore, in building up to an export figure of 10,000,000 tons. He hoped that conditions might change, but at present that would be too heavy a burden for the board to bear financially.

Referring to the shortage of men in the industry, MR. GEORGE said that there had been a net loss of 16,308 men in the first 28 weeks of this year, and the drain was continuing at the rate of 900 a week. Although an intensive recruitment campaign had been conducted by the board, no method had yet been devised to stop that drain.

The loss of manpower, however, had been a spur in concentrating more attention on mechanization. It had been said before that in 1965 80 per cent. of the output should be coming from new pits or reconstructed pits. In 1961, 400 new power loading machines were being installed, and by the end of the year 50 per cent. of output would be power loaded compared with 42 per cent. at the end of 1960. The ultimate objective was complete mechanization, wherever possible.

Doubts on New Standard for Mining Examinations

FEAR that the introduction of the proposed new type of mining examination would prevent some mineworkers from becoming colliery managers was expressed by MR. ALFRED ROBERTS (Lab.), who said the introduction of the new examination or standard would mean that the only approach available to those not in possession of a degree or diploma would be via the new examination. The opportunity of qualifying with that would be not a right for the individual but a privilege.

The National Association of Colliery Managers was not satisfied, he said. It did not mind the standard being raised, but believed that every individual inside a mine should have equal opportunity and that it should not just depend upon the goodwill of the National Coal Board. Many young people who left school at 15 might be anxious to go into the mines, and might continue until they were 21 and become shotfirers or deputies. It might then be realized that they were potential colliery managers, and if such a man proved to be the right type he should be able to qualify by right as a colliery manager.

MR. JOHN C. GEORGE, Parliamentary Secretary to the Minister of Power, said the examination regulations had not yet been altered, and no application had been made to the Minister to alter them, although the possibility of changes had long been notified to the industry. If changes were made, some people would undoubtedly be unable to take the examination

who could have in the past. The Minister, he said, was receiving a deputation from the NACM and the British Association of Colliery Management, and would consider everybody's views before deciding whether to alter the regulations. He would naturally attach very great importance to the decision reached by the Mining Qualifications Board.

DENATIONALIZATION OF RTB

THERE was no Government reply to a statement by MR. E. L. MALLALIEU (Lab.) that it was being said that "greedy eyes" were being turned on the Redbourn works of Richard Thomas & Baldwins, Limited, in order to have it hived off from the combine and sold separately because, perhaps, there was not a sufficient concentration of capital in the country at present to take over the whole combine.

MR. MALLALIEU said it would cause great upset if such a wanton piece of destruction took place and this efficient works in an efficient combine were hived off merely for the doctrinaire purposes of the Government. "I hope that there are not any ideas in the Government's mind of choosing this moment to hand back Richard Thomas & Baldwins to private investors . . ." he added.

MR. JOHN C. GEORGE, Parliamentary Secretary to the Minister of Power, reaffirmed the Government's intention to denationalize RTB within the lifetime of the present Parliament. This decision, he said, had been made before the present economic crisis came upon the country, and the Government intended to carry it out when the time was suitable.

OPEN-CAST MINING

ASKED by COL. LANCASTER (Con.) what the present policy was towards proposals by the National Coal Board for the use of compulsory rights orders under Section 4 of the Opencast Coal Act, 1958, MR. RICHARD WOOD, Minister of Power, stated in a written answer that the board was prepared to let fresh contracts for open-cast mining where necessary to meet short-term difficulties in securing adequate supplies of particular kinds of coal such as Welsh anthracite.

Wherever possible, he added, the board sought to obtain the necessary rights in land by voluntary treaty. Where this could not be done, he was prepared to consider applications for the confirmation of compulsory rights orders.

SMALL MINES LICENSING

MR. RUPERT SPEIR (Con.) asked if, in view of the manpower shortage existing in areas of deep mines, the Minister of Power would give a general direction to the National Coal Board to increase the number of licences to open or extend work at small mines, many of which were situated in areas where there was substantial or potential unemployment.

MR. J. C. GEORGE, Parliamentary Secretary to the Minister of Power, replied "No." The licensing of small mines was the statutory responsibility of the Coal Board, he said, and though its main concern must be the need for the output from a proposed mine, it was ready to take the local employment situation into account in considering applications.

THE HOUSE will resume after the Summer Recess on October 24.

WHILE agreeing that coal was a traffic suitable to rail, it was the Government's policy to permit the transport of coal by lorry according to the desire of the user and the facilities available, the Minister of Transport told Mr. Philip Noel-Baker (Lab.).

Coal Chartering

ALTHOUGH interest is maintained, coal chartering from Hampton Roads to Japan has been quieter with large tonnage recently fixed at $8.85 for second half August and 20,000 tons was taken for September at $8.80, both basis six days. Today about $8.50 to $9.00 is indicating for large forward carriers. Tonnage is also required to the Brazils and some possibilities to the Lower Plate. Roads/Savona recently fixed 16,000 tons vessel at $4.30 for August. Tonnage might be worked from the Roads to Antwerp, Rotterdam or Amsterdam at about 27s. 6d. One of the features of interest on the outward market is the strong demand for tonnage to load pig-iron out to Japan, inquiries emanating from UK, Continent, and Spain, but tonnage is difficult to obtain and the delay in discharging in Japanese ports does not help charterers.

Chartering from the UK ports is generally quiet and from the South Wales area there appears to be difficulty in arranging stems; tonnage is reasonably well held by owners. Cardiff/West Italy reports 4,500 tons for August 18 at 26s. 6d. and 4,250 tons also from Wales/West Italy, about same position and at the same rate. Coasting inquiry is maintained and Barry/Caen paid 20s. for 530 tonner for prompt. There is also a good demand from East Coast to Scandinavia.

There is some demand from the continental ports to the Mediterranean and possibilities to the Adriatic.

Welsh Brewer's Suggestion to Avoid US Coal Imports

"MIGHT not some improvement be achieved if the permitted size of the licensed mines could be increased and operated by the steel companies, who should then be able to secure an adequate supply of the world's finest coking coals, which are sitting on their doorstep?" This suggestion was made by Col. H. M. Llewellyn, chairman of Rhymney Breweries, Limited, in his statement to shareholders at the annual meeting last week.

The coal mining industry, upon which they so largely depended, he said, had still not returned to a state of full prosperity. He hoped that the NCB's recent sales drive would meet with success and that other companies in South Wales would use coal wherever possible—as they did in their breweries.

He believed that the steel companies would have to import some foreign coals in order to remain competitive in the world market, but he hoped a high proportion of Welsh coking coal would be used.

Price of Attracting Labour

OUT of last year's national wages bill of £8,600,000,000, about £1,500,000,000 was in the form of payments over and above agreed time and piece rates, according to the Bulletin of the British Employers' Confederation. Wages have outstripped productivity, it is suggested, because of the pressure of demand for labour involving some degree of training or skill.

Expanding companies can get such labour only by attracting men from other employment, and the extent of these attractions, offered in the form of premium rates of one kind or another, has become crucial.

Mining Accident Trends in the South Midlands

by A. CHAPLIN* and H. G. MITCHELL†

In this paper, presented to the South Midland Branch of the National Association of Colliery Managers on October 10, 1960, the authors review the trends of accidents in the Leicestershire and south Derbyshire coalfield during the 10 years from 1950. In confining the examination to one coalfield, it is realized that the trends revealed may differ in some aspects from the national pattern, but it is possible to examine the problem in greater detail. In addition to a general consideration, the accident rates are compared with the seams being worked, age groups, and parts of the shift in which they occurred.

THE serious problem of death and injuries to persons engaged in coal mining, with the resultant pain and suffering and the wastage of human labour, has always been in the mind of mining engineers and others with responsibility in the industry. The occurrence from time to time of explosions, ignitions, and other large-scale disasters forcibly brings mining hazards to the public notice, but while such happenings are indeed tragic it is the less publicized day-to-day accidents which have the most marked effect on the death and injury rates.

The scarcity of suitable and skilled manpower of recent years has not made the problem any easier, and considering the potential worth of the injured men to the industry and the misery and suffering caused by accidents, then every practicable means of prevention, by HM Inspectorate, management, and labour, is surely justified.

At the present day, the future of the industry is jeopardized by a shortage of recruits of the right calibre. Every mining disaster may be a further deterrent to recruitment, and each local fatality, each local accident, may strengthen the resolve of many parents to dissuade their sons from entering the pits. Apart from the overriding humanitarian aspect, therefore, it is of paramount importance that efforts to reduce accidents should be relentlessly pursued.

In confining this paper to the Leicestershire and south Derbyshire coalfield it is realized that the trends revealed may differ in some respects from the national pattern. On the other hand, by considering one Area alone, it is possible to examine the problem in greater detail.

Although certain hazards which afflict many other districts, such as high yields of gas, working under liquid deposits, and the problems attendant on mining at great depths, are not normally present in this coalfield, there are other special dangers which directly or indirectly influence safety. Seams which are above the average in thickness may give high productivity, but are not an unmixed blessing when the safety angle is examined. The complex geological structure, with innumerable faults, particularly in the western portion of the coalfield, is also a factor to be reckoned with. Probably more important than either of these factors is the increasing amount of interaction with several seams worked at close intervals of time and in close proximity to each other.

For the purpose of this paper, the available statistics from 1950 to 1959, inclusive, have been examined, as it is considered this period is sufficiently long for trends to be discernible and at the same time sufficiently recent.

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† Safety engineer, No. 7 Area, East Midlands Divisional Coal Board.

It is well known that in the previous 10-year period, 1940 to 1949, there was a spectacular improvement in accident rates, particularly in regard to fatalities, but since then there has been, perhaps inevitably, a levelling off in the rate of progress. By examining the position in some detail it is possible to see in which categories the trend remains favourable and the factors which are holding back a further advance in other directions.

Reportable Accidents

The division of mining accidents into two main classes, those causing "fatal or serious bodily injuries" and "compensable" accidents, is a somewhat arbitrary one and may give rise to anomalies. To clarify this more fully, serious bodily injury includes the following:—Fracture of skull, spine, pelvis, arm, forearm, thigh, or leg; dislocation of shoulder, elbow, hip, knee, or spine; amputation of hand or foot, or substantial part of a hand or a foot; loss of sight of an eye; other serious bodily injury, *e.g.*, internal haemorrhage, burns, asphyxia, or other injury likely to endanger life, cause permanent incapacity for work, or substantially impair efficiency.

With respect to any doubtful cases, it is suggested that they be reported to HM Inspector of Mines and Quarries so that a decision can be made as to whether they should be included or not.

During the period under review the actual number of accidents reportable to HM Inspector of Mines and Quarries has remained practically constant, although subject to fluctuations from year to year, and if the earlier five-year period, *viz.*, 1950 to 1954 is compared with the later period, there is virtually no change. Table 1 shows this comparison. The only comfort to be derived from these figures is in the reduction in fatalities.

An analysis of the numbers into various categories, however, reveals changes which may well have some significance. Fig. 1 shows the numbers of reportable accidents classified according to cause and subdivided under the five main headings used by HM Inspectorate. These are in conformity with those used in the NCB Accident Return (Stats. 308A). Further reference will be made to these figures when examining the classifications in detail. Figs. 2, 3, 4, 5, and 6 show the same accidents classified in various ways.

TABLE 1.—*Comparison of Number of Serious Accidents Between the First and Second Half of the* 10-*year Period* 1950-1959.

	1950 to 1954	1955 to 1959
Fatal	33	26
Other serious	180	187
Total	213	213

Dangerous occurrences which did not result in casualties are outside the scope of this paper. In a number of instances, considerable potential risk was involved and a review of safety cannot entirely ignore this aspect. Prevention of dangerous incidents is obviously a most important part of accident prevention. A large proportion of such incidents in this particular coalfield have been cases of spontaneous heating, and the fact that they have been overcome without injury to personnel is much to the credit of the managements concerned, assisted by the valuable service of the rescue organization and the scientific department.

This should not lead to any degree of complacency because here surely is a clear illustration of the adage "Prevention is Better than Cure."

The importance of salvaging materials from old districts as soon as ever possible and then sealing off the access roads has been fully demonstrated. Air samples taken at strategic points as a routine measure have on many occasions led to the detection of incipient heatings long before the well-known signs and symptoms have been apparent in the pit. This, of course, in no way reduces the need for constant vigilance on the part of underground officials.

Accidents which are Not "Reportable"

Under the Factories Act, 1937, accidents causing loss of life or disablement for more than three days must be notified to HM Inspector of Factories, but under the Mines and Quarries Act, 1954, accidents notified to HM Inspectors of Mines and Quarries are confined to fatalities and those causing serious injury, together with those which must be reported if they are the result of certain specified dangerous occurrences.

In 1959 there were, in addition to the 46 non-fatal accidents (involving 50 persons) investigated by HM Inspectors of Mines and Quarries, a further 2,825 accidents causing more than three days' incapacity which were not investigated

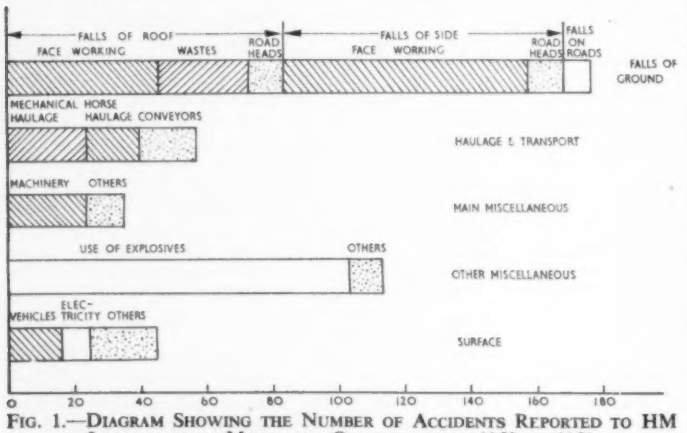

FIG. 1.—DIAGRAM SHOWING THE NUMBER OF ACCIDENTS REPORTED TO HM INSPECTORS OF MINES AND QUARRIES FROM 1950 TO 1959.

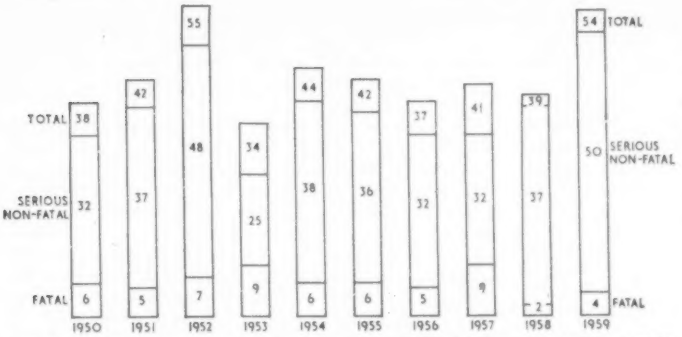

FIG. 2.—NUMBER OF REPORTABLE ACCIDENTS EACH YEAR FROM 1950 TO 1959.

in this way. Although many of the latter were of a minor nature, some involved lengthy periods of disablement and may often be a bigger drain on the resources of the industry than some of those causing serious bodily injury.

All accidents of this nature are recorded and analyzed by the NCB safety branch, and it is customary for the circumstances of each accident to be examined and discussed at meetings of colliery safety committees. These committees are doing a useful job and the members are usually very keen and interested; the great problem is how to spread the information and safety consciousness to the rank and file who are not on the committees. Statistics compiled from data supplied by each colliery on monthly accident forms are given a wide circulation and any trends in the various classifications can be readily traced.

Trends do correspond in some cases with similar categories of accidents reported to HM Inspector of Mines and Quarries, but there are so many unaccountable differences that it would be fruitless to attempt a correlation. It is satisfactory to record that during the period under review there has been an appreciable downward trend.

When considering "compensable" or "over three days" accidents, a degree of mental reservation is necessary owing to certain imponderable factors. It is obvious that a man does not get involved in an accident because he so wishes, but quite often the actual time lost from work may be affected by extraneous circumstances. For example, changes in procedure for payment of industrial injuries benefits, inclement weather, prevalence of sickness, all appear to have had some effect on the statistics. It also seems probable that a person somewhat "below par" in health may be more accident-prone, although it is difficult to offer direct proof of this statement.

However, these factors are of insufficient importance to affect the general trend portrayed by the statistics. Although a large proportion of the "over three days" accidents result in comparatively minor injuries, there are several good reasons why the circumstances of each of these numerous accidents should be carefully examined. These may be listed as:—

(1) Some of the accidents result in quite serious injuries (with consequent claims for damages at common law). We do not propose to elaborate this point, which was dealt with in great detail by Mr. H. E. Tyson in his presidential address to NACM in June, 1960[1].

(2) Many of the non-reportable cases are due to exactly the same causes which frequently result in major injuries or death.

(3) Many of the accidents are repetitive and the same type of accident continually repeated obviously calls for preventative action.

(4) They represent a colossal waste of productive manshifts.

To illustrate the last point, the number of days' work lost by accidents of more than three days incapacity during 1959 was 60,320, according to the statistical tables. Actually, the total number of lost manshifts was far higher because the statistics take no account of the minor injuries resulting in less than three days' absence nor of shifts lost by incapacity of more than 12 months' duration. So that, considering an o.m.s. of 43½ cwt. overall, the tonnage lost in the South Leicestershire and Derbyshire coalfield could be at least 150,000 tons in a year.

In examining Table 2, which shows accident rates classified according to cause, it will be noticed that in some categories the method of classification has been altered slightly during the period and this has affected the rates to some extent. This is particularly noticeable in the column headed "Others," which shows a fall from 28.8 in 1950

TABLE 2.—*Accident Rates per* 100,000 *Manshifts According to Cause. All Accidents Involve Over Three Days' Incapacity.*

Year.	Falls of ground.				Haulage.	Machinery.	Use of tools.	Falling objects.	Handling materials.	Stumbling and falling.	Shot-firing.	Others underground.	Surface.	Total.
	Roof.	Side.	Roads.	Total.										
1950	19.4	11.8	5.4	36.6	13.8	2.3	22.2	9.3	13.5	14.5	0.2	28.8	41.9	116.0
1951	18.3	9.9	4.3	32.5	10.7	1.5	19.3	8.0	14.6	14.4	0.3	23.4	35.4	102.5
1952	18.9	10.7	3.7	33.3	9.3	2.2	22.0	6.5	16.9	14.4	0.5	20.3	35.7	103.6
1953	21.0	13.5	1.1	35.6	11.4	1.6	22.9	7.3	21.3	15.3	0.4	16.3	34.4	108.9
1954	19.2	10.8	1.8	31.8	8.9	1.4	20.7	6.2	22.5	14.0	0.4	14.8	32.2	99.9
1955	16.1	9.3	1.5	26.9	8.2	1.3	21.7	9.4	22.8	14.8	0.4	12.0	29.8	97.4
1956	18.6	10.1	1.3	30.0	8.8	1.8	19.5	8.5	21.6	16.1	0.3	11.7	28.7	98.0
1957	16.0	9.8	1.4	27.2	9.2	2.7	15.0	11.0	17.3	14.3	0.2	10.2	26.2	88.3
1958	15.6	10.1	1.5	27.2	10.7	2.8	14.3	12.1	18.3	12.8	0.3	8.6	28.0	89.1
1959	16.4	7.3	1.9	25.6	9.1	2.2	15.4	11.0	17.8	13.9	0.2	9.5	29.8	88.0

to 9.5 in 1959, which is most probably due to a more accurate classification. The most satisfactory feature of this table is the falling trend in the rate of accidents caused by falls of ground.

The rates for "Haulage" have remained fairly static, while those for "Machinery" and "Falling objects" show an unfavourable trend. Increased mechanization is probably responsible for the increased rate of accidents due to machinery, and the extended use of heavier supports, especially in the thicker seams, has affected the figures for "Falling objects." A high proportion of the objects are steel props, many of them not actually set, which fall across men's feet and legs.

Although still high, the rate for "Use of tools and appliances" has been reduced to quite an appreciable extent and it may be fair to attribute some part at least of the improvement to an increased usage of protective clothing, chiefly safety gloves.

The column headed "Surface" contains some disappointing figures. In the first half of the decade the rates fell appreciably, but there has been no further improvement during the last five years; in fact, the recent trend is upwards.

Falls of Ground

Accidents caused by falls of ground, which are invariably associated with roof movement and support of strata, usually at or near the coal face, have been a fundamental problem since mining began. Prevention has received considerable attention for many years by committees of investigation, by mining engineers and HM Inspectors, and, more recently, by strata control specialists. Legislation has played a part, notably the Coal Mines (Support of Roof and Sides) General Regulations, 1947, which were re-enacted as the Coal and Other Mines (Support) Regulations, 1956. However, the high proportion of accidents due to falls of ground remains the most striking feature of the classification tables. If those shotfiring and electrical incidents which resulted in no serious bodily injury are excluded, it is seen that during the 10-year period 60 per cent. of the underground accidents causing fatal and serious bodily injury were due to this cause, including 80 per cent. of all underground fatalities.

In view of the many efforts made to reduce accidents, the figures for accidents causing death and serious bodily injury are disappointing, although the rates for all accidents of over three days incapacity reveal a falling trend throughout the period. There can be no doubt that the introduction and development of hydraulic supports and improved techniques of strata control, together with the focusing of attention on certain notorious danger spots, have played an important part in maintaining this trend.

A subdivision of the face accidents into falls of roof and side, respectively, shows that the serious accidents are almost equally divided between the two categories, *viz.*, 83 falls of roof and 86 falls of side.

But the effects of the falls of roof are generally more serious, as is indicated by the fact that there were 31 fatalities from this cause, compared with 10 from falls of side. It is also interesting to note that in each year far more "over three days" accidents were due to roof falls than to side falls. In 1959 the proportion was 16.4 roof to 7.3 side.

The analysis of fatalities according to the seam in which they occurred is shown in Fig. 7. The numbers involved may be too small to have any real significance, but it will be noted that of the more extensively worked seams, the rates per million tons are highest in the Middle Lount and Stockings seams.

Falls of Roof

A further subdivision indicates that of roof falls causing fatal or serious injuries 55½ per cent. occurred along the faceworking, 32½ per cent. on the waste side, and the remaining 12 per cent. at the roadhead. Falls of roof along the faceworking are generally associated with newly exposed ground and a high proportion of the accidents was due to roof stone reeling out the temporary or newly set permanent supports. The increased use of props which can be pre-loaded should help to solve this problem.

Falls of roof in wastes accounted for 10 fatalities and a further two occurred in roadside packholes. Accidents in wastes are remarkably repetitive and the same description recurs again and again. Most of them occur by definition at the edge of the waste and in many cases men have ventured beyond the line of supported roof.

It is a disturbing thought that more packers were killed than strippers. More accidents

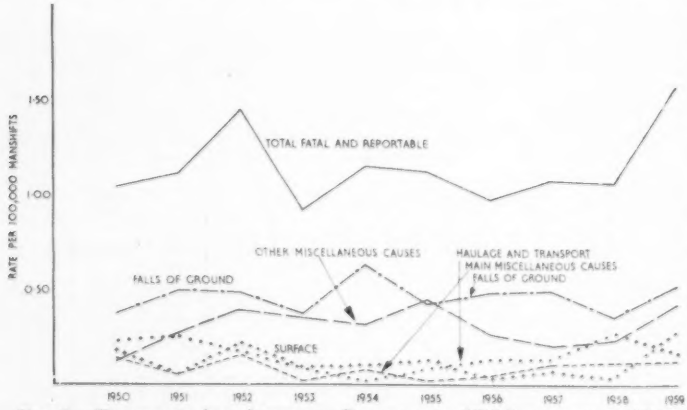

FIG. 3.—TRENDS OF ALL ACCIDENTS REPORTED TO HM INSPECTOR OF MINES AND QUARRIES BETWEEN 1950 AND 1959.

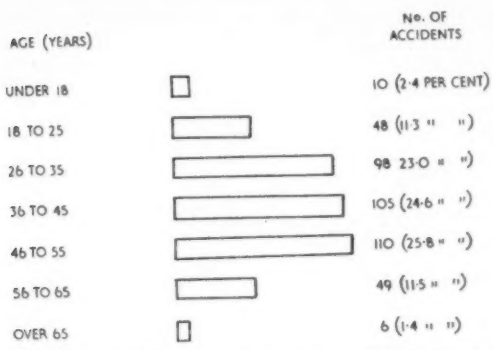

FIG. 4.—ALL ACCIDENTS REPORTED TO HM INSPECTOR OF MINES AND QUARRIES EXPRESSED BY AGE GROUPS.

happened to men withdrawing or advancing supports than to those engaged in packing or collecting building material, but there were sufficient casualties during the latter operation to warrant serious concern. Apart from the overriding question of supervision, it would appear that the best way to reduce these accidents is to remove temptation and ensure that there is an ample supply of suitable material within easy access so that there is no incentive for packers to take unwarranted risks. The use of Hydrox and Cardox for waste-blowing is a help, but total caving may be the answer in suitable cases.

Unfortunately, no authentic figures to give a comparison between strip packing and caving are available, but it appears that more waste accidents occur with strip packing than with caving. Total caving has only been widely adopted during the last three or four years, so that the experience to date is insufficient to draw positive conclusions.

At first sight the number of roadhead accidents seems moderate, but it should be remembered that these are very localized places of small area compared with the general run of the face. In proportion to the amount of roof and side involved they are by far the most vulnerable parts of the coal face. Moreover, the severity rate is much greater. If we include the adjacent stable holes, 11 of the 41 face fatalities occurred in the vicinity of the roadhead.

During the earlier part of the period under review it became apparent that the frequency of roadhead fatalities presented a serious problem. Owing to the tendency for conveyor gearheads to become larger, difficulties were encountered when moving them over into the next track. In some cases the problem was aggravated by the provision of turn places for coal cutters adjacent to the roadhead. The introduction of power loaders requiring stable holes added a further area in which supports had to be moved after their initial setting.

The problem was not confined to the No. 7 Area of the East Midlands Divisional Coal Board; it existed throughout the division. In several cases there was a wholesale collapse of roof in the roadhead vicinity, which, on some occasions, led to serious or fatal injuries, while in other cases there were very narrow escapes which are not revealed in the statistics.

Much attention was directed to the improvement of support systems at roadheads.. An Area instruction was issued requiring chocks or "chock props" to be included in the support systems except, of course, where the roads are ripped up to the face. This was superseded by an East Midlands Divisional Coal Board instruction which demanded that extensible props must be used. A further divisional instruction set out three permissible arrangements of roadhead supports, the emphasis being on the principle that girders set at right angles to the line of face cross the induced breaks. About the same time a pamphlet was issued by the Support of Working Committee under the chairmanship of HM Divisional Inspector of Mines and Quarries which dealt comprehensively with this subject.[2]

The implementation of these measures has undoubtedly contributed to the improvement of standards at roadheads, and even where, owing to local conditions, some modification of the recommended systems has been necessary, constant attention to the problem has led to enhanced safety. The fact that eight of the 11 fatal accidents referred to occurred in the period 1950 to 1954, compared with three in the period 1955 to 1959, suggests that the efforts have been worthwhile. The contribution made by the manufacturers of machinery in designing more compact machines, *e.g.*, conveyor drives, should not go without mention. The design of some modern hydraulic drives suggest that their compactness could be used to considerable advantage in the vicinity of roadheads and stable holes.

Falls of roof outbye the ripping lip have not been a serious problem in No. 7 Area, but it is generally felt that something more effective than the usual horseheads would be a step in the right direction. Experiments with ripping boxes, which enable the permanent arches to be set earlier in the shift have been undertaken, but it is doubtful whether a really satisfactory type of box has yet been evolved.

Falls of Side

Subdivision of serious accidents caused by falls of side gives the following results:—Falls from the working face, 87 per cent.; and roadhead falls of side, including falls from face of lip, 13 per cent.

Many of the accidents due to falling coal could be avoided if men would work on the buttock instead of along the fronts. The direction of cleat relative to the line of face is often queried, but the effect is less in this coalfield than in most others because the cleat is usually ill-defined. The incidence of accidents has been reduced, more particularly the accidents of over three days' duration, and it is believed that the raising of the cutting horizon has been a contributory factor. It is practice in the Area to cut all seams exceeding 4 ft. thick above floor level, except where the

existence of ironstone bands or boulders renders this impracticable. The important effect of power-loading on "falls of side" will be referred to later.

Falls from the face of the front lip continue to take their toll and various alternatives to the normal L-bars have been tried, including strata bolting in a few cases. Most of these alternatives or supplementary means of support are effective when they have been erected, but it is during the period between the dropping of the lip and the erection of the supports that most of the accidents happen. A shortening of this period to the absolute minimum is the best guarantee of safety.

It is satisfactory to note that there were only eight fatal and serious bodily injuries caused by falls of side on roadways during 10 years. The rate for all accidents of over three days' duration is also relatively low. The higher figures recorded in the first three years may have been partially due to the means of classification. It is now fully understood that only falls occurring more than 10 yd. from the face come under this heading.

Haulage and Transport

After "falls of ground" the next most important cause of underground accidents is by "haulage and transport."

It will be seen from Fig. 1 that there were 57 fatal and serious accidents under this heading, which is approximately one third of the number due to falls. It is interesting to note that the total number of "over three days" accidents in the two categories is in the same ratio.

A somewhat surprising feature is the high figure for transport by vehicles (40), compared with 17 reportable accidents involving conveyors. Considering that the coal is carried almost entirely by conveyors, it is obvious that most haulage accidents occur on the supplies routes.

It is generally agreed that modernization of coal transport systems has by far surpassed that of supplies haulage and it is only during the last two or three years that the transport of supplies has begun to be overhauled and remodelled to a similar extent. There has been scarcely sufficient time for this reorganization, which in some cases is still in progress, to affect the accident rates, but there is reason to expect that the improved methods will benefit safety as well as general efficiency.

Where conveyors are involved, the accidents may almost invariably be regarded as due to machinery, although officially classified as "haulage." In order to avoid any possible tendency to minimize the seriousness of machinery accidents, it was decided to include them in the review of such accidents.

Accidents Caused by Machinery

In considering accidents caused by machinery it is important to explain clearly which types of accident are included. The NCB accident return "308A" classifies conveyor accidents, whether on the face or on the roads, as "haulage" and also accidents caused by contact with machinery, ropes, or pulleys used in haulage operations. But, in view of the importance of safety in relation to machinery of all kinds, it was decided at this stage to review the position on a broader basis, although this will involve some overlapping with other classifications.

TABLE 3.—*All Accidents Due to Machinery Reported to HM Inspector of Mines and Quarries.*

Type of machine	Period 1950-54.		Period 1954-59.	
	Fatal.	Non-fatal.	Fatal.	Non-fatal.
Coal cutters	2	9	1	1
Power loaders ..	—	—	1	5
Conveyors:				
(*a*) Face	—	3	1	3
(*b*) Roadway ..	—	4	—	9
(*c*) Surface ..	—	2	1	1
Other machinery ..	—	—	—	2
Total	2	18	4	21

Accidents involving machinery may be considered under four main headings, which are shown in Table 3. It may be argued that the table is not fully comprehensive because shaft accidents and those due to mechanically propelled vehicles have been omitted; nevertheless, it is a formidable list.

In dividing the decade into two five-year periods it is found that the trend is unfavourable. It is true that mechanization has proceeded rapidly during the whole of the period under review, but this does not make the rise in the number of serious accidents any less regrettable, and investigation of the individual circumstances indicates that most of them could have been avoided. The figures reveal that in the earlier five-year period, 11 accidents reported to HM Inspector of Mines and Quarries, including two fatalities, were concerned with the operation of coal cutters whereas in the later period only two accidents were noted, though there were six cases involving power loaders.

The notable improvement with regard to coal cutters was, unfortunately, counterbalanced by a deterioration so far as conveyors were concerned, represented by an increase of from nine to 15 accidents, including two fatalities in the more recent period.

From the brief particulars of these 15 cases, it

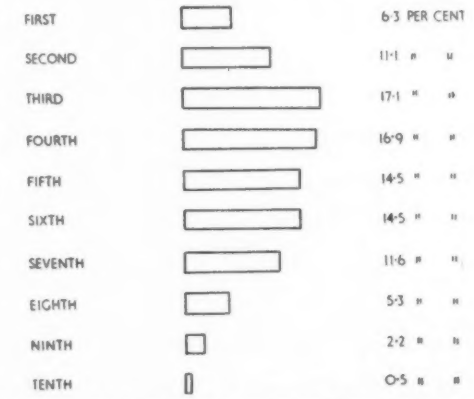

FIG. 5.—ALL REPORTABLE ACCIDENTS EXPRESSED BY THE HOUR OF THE SHIFT IN WHICH THEY OCCURRED.

will be seen that most of them were repetitive accidents due to a few simple causes. They are as follow:—

(1) While releasing piece of stone from chute at transferpoint, arm drawn between chute and delivery drum; arm severed at elbow.

(2) Arm drawn into delivery drum of conveyor while attempting to remove a piece of debris; arm severed above elbow.

(3) While taking a bar from a moving armoured conveyor; hand crushed against roof resulting in amputation of hand.

(4) Chock blocks being transported by armoured conveyor staked under shearer plough which was projected forward, striking a timberer; both legs fractured.

(5) Trapped between conveyor belt and roof when riding on conveyor, fracture of first lumbar vertebrae.

(6) While adjusting tension end of main washery feed belt; the conveyor was inadvertently started, resulting in fatal injuries.

(7) Arm taken round a conveyor roller while cleaning up; fractured forearm.

(8) Arm drawn into delivery drum of trunk conveyor; arm severed at elbow.

(9) Taking girders from a stationary roadway conveyor when conveyor was started, dislocating elbow.

(10) Fell on to flights of armoured conveyor while crossing it; dislocation of sterno-clavicular joint.

(11) While drawing off a waste the sylvester chain caught a moving flight of armoured conveyor; fatally trapped against a steel prop.

(12) Removed plate covering tension end of gate conveyor. Moving belt drew arm into drum, fracturing forearm.

(13) Arm caught in delivery drum of conveyor in heading; severe injuries to tendons of arm.

(14) Arm trapped between belt and delivery drum of trunk conveyor; amputation of arm.

(15) Arm drawn into delivery drum of surface conveyor; amputation of forearm.

The list is a formidable one and the necessary brevity of the description leaves out many important details. Several of the accidents occurred when the men concerned were cleaning out or attempting to remove a small obstruction near the delivery drum while the belt was in motion. In other cases the machinery was started up inadvertently while repairs or adjustments were being made.

The attention which is being given to such matters as the locking-out of switchgear while men are working on machines and the drive for constant maintenance of fencing, should, together with the widespread publicity given to this type of accident, lead to an appreciable reduction in the future.

Shotfiring Accidents

Shotfiring accidents figure largely among those reportable by reason of cause rather than by reason of severity of injury. Where the injuries are not serious enough to make an accident reportable under Section 116 of the Mines and Quarries Act, 1954, it is recorded separately as a "dangerous occurrence" under Section 117 of the Act.

It may be thought that the inclusion of some very minor injuries on the list of reportable accidents tends to exaggerate the importance of this particular mining hazard. In some cases no actual time is lost from work and, in many cases, less than three days' absence is involved. On the other hand, some shocking accidents have occurred causing permanent incapacity or lifelong disfigurement.

Long-term Solution

Although the need for maximum care and strict observance of the regulations must be stressed, the human element cannot be ignored and a widespread reduction in the use of explosives is the long-term solution. Additional to the overriding necessity of complying with the statutory regulations full advantage should be taken of such useful aids as red discs and safety curtains.

For the comparatively few cases in which there has been a deliberate and reckless disregard not only of regulations but of commonsense there can be no excuse. Sometimes flagrant abuses in connection with explosives are brought to light before any damage is done, but we consider that persons guilty of such dangerous conduct should be removed from any position in which they will have any further dealing with explosives. It is evident that either they do not realize the potential dangers or are temperamentally unfitted to handle explosives; they are a menace to themselves and to everyone in the pit.

Table 4 shows an analysis of all the accidents due to explosives which were reported during the years 1954 to 1959.

TABLE 4.—*Analysis of 54 Shotfiring Accidents Involving Injuries to 56 Men.*

Persons injured	Shotfirer	6
	Other persons	50
Distance from shot	20 yd. and over	31
	5 to 20 yd.	6
	Less than 5 yd.	14
	Doubtful	5
Position of shot	Fast end	12
	Roadhead	16
	Flanking shots on face	8
	Other shots on face	14
	In headings	3
	At back rippings	1
Cause	Reliance on distance only	15
	Partial but inadequate cover	14
	Distance and cover both inadequate	5
	No sentry posted or shot not guarded	11
	Stripper illegally coupled shot to cable	2
	Drilled into live shot	1
	Premature emergence from cover	2
	Possible ricochets	4

In 55 per cent. of the accidents the injured person was at least 20 yd. from the shot. In 28 per cent. of the accidents distance *alone* was relied upon for safety. In 20 per cent. of the accidents no sentry was posted or the shot was not guarded.

In the accidents classified by the position of the shots, 22 per cent. were face-end shots, and 30 per cent. were at roadheads pointing down the gate.

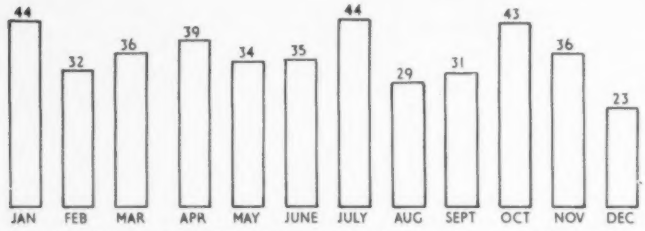

FIG. 6.—ANALYSIS OF REPORTABLE ACCIDENTS INTO THE MONTHS OF THE YEAR.

Most of the latter were ripping shots, but some were coal-face shots across the way-head.

The "flanking shots" which were responsible for eight accidents were mostly light shots fired for the purpose of blowing down pieces of hard back coal. There is no reason to think that they were "on the solid," but the finding of adequate shelter from such shots sometimes presents difficulty.

The possible dangers of ricochets should be well known to shotfirers, who should guard against them by using the safety nets provided. It is probable that many of the shots which caused fragments to be projected for long distances were overcharged.

Miscellaneous Causes

In addition to the main causes of underground accidents there are a number of other categories of a widely divergent nature.

The principal headings under which these miscellaneous accidents are placed are:—

(1) Use of tools and appliances.

(2) Handling materials, which includes loose coal and packing stone.

(3) Stumbling, falling, and slipping.

(4) Falling objects.

(5) Others, which includes all accidents which cannot be fitted into any of the other categories. Numerous sprains and strains come under this heading.

The number of serious accidents which fall within these categories is, fortunately, quite moderate and only amounts to 7 per cent. of the total reportables; but they swell enormously the figures of minor accidents. It will be seen from Table 2 that the average rate per 100,000 manshifts for these five categories was 76.9, compared with 43.0 for all the rest. This means that 64 per cent. of all underground accidents were due to these miscellaneous causes.

The reduction of the incidence of these essentially simple accidents has proved a baffling problem. The time lost as a result of them is obviously tremendous. They are the constant preoccupation of safety committees and are the bane of safety officers.

The figures fluctuate from year to year and from pit to pit, but, on the whole, there has been an improvement and in 1959 the rate was 67.6 compared with the average of 76.9 for the 10-year period.

The introduction and rapid extension of power loading has had an important bearing on coal-face accidents, but the actual effect measured in terms of rates per 100,000 manshifts has been very variable and sometimes apparently contradictory. Consequently, the only figures of any value in this respect are those relating to the most recent years, during which time face mechanization has become more firmly established and the numbers of manshifts and accidents involved have been large enough to enable a trend to be discernable. We have therefore directed attention to the influence of power loading during the years 1957, 1958, and 1959, and comparison with hand-loaded faces is made in Fig. 8.

It has been noticed that in many cases the accident rate on a newly started power loaded face is very high, particularly where it is the first introduction of a certain type of machine to the colliery concerned. The number of miscellaneous accidents due to handling materials, use of tools and appliances, and falling objects may initially be much higher than on a comparable conventional face, but after a few months the rate tends to fall as the men become more accustomed to the new technique and more experienced in the use and handling of heavier and perhaps awkwardly shaped supports and other materials.

A possible help in reducing the number and severity of such miscellaneous accidents is the fact that, generally speaking, efforts to persuade men to wear protective gloves have been more successful on mechanized than on conventional faces. Examination of the figures shows that, so far as falls of roof are concerned, there has been no significant trend either from year to year or in comparing the two types of coal face. On the whole, the rate was slightly higher on the mechanized faces.

With regard to falls of side the position was definitely much better on mechanized than on hand-loaded faces. It is reasonable to attribute this to the smaller proportion of men at risk from falling face coal and to the absence of overhanging coal. When it is remembered that this category includes falls from the face of the front lip and falls of side in the gates within 10 yd. of the face, the actual improvement in falls of coal from the face is very considerable.

The position is, however, very much dependent on the types of power loader in most general use. The advent of the trepanner has introduced a potential hazard from falls of face coal, which can best be overcome by making it unnecessary for a man to clean up on the face side of the conveyor. Trials are being conducted at the mines using this type of machine with a view to finding the most efficient way in which this object may be achieved.

It is desirable, however, to avoid the necessity of the cleaning up on the face side of the conveyor with all types of power-loading machines working

with prop-free fronts. As would be expected, accidents due to machinery were much more numerous on power-loaded faces and it is regrettable that there were a number of distressing injuries and several fatalities.

The trend of miscellaneous accidents on mechanized faces is downwards and, whereas in 1957 the rate was 109.1 compared with 80.5 on conventional faces, the position was reversed in 1959, being 86.9 mechanized and 90.1 conventional.

Surface Accidents

The rate for accidents occurring at the surface of mines is much less than for those underground, but in view of the far greater hazards underground the surface rate may be regarded as unduly high. During the period under review there were 44 accidents reportable to HM Inspector of Mines and Quarries which included seven deaths.

The subdivision indicates that 11 "reportable" were haulage accidents involving railway wagons, or tubs and trolleys running on rails. There were also four cases in which trackless vehicles were involved, so that altogether 15 serious accidents including five fatalities were due to men being struck by moving vehicles.

The nine cases under the heading of "electricity" may call for some comment. Most of these were reportable by reason of cause rather than severity of injury. There were, in fact, six separate incidents in which nine men were injured, and the most serious involved three electrical engineers employed by an outside firm.

Surface machinery accidents have already been mentioned and the remainder included men falling from a height (four) and being hit by falling or projected objects.

While the underground rate for accidents of over three days' duration shows a falling trend, there has been no corresponding reduction at the surface. This disappointing result is difficult to explain, especially in view of the improvements which have been made in resurfacing of travelling routes and in better lighting.

In 1959, there were 228 surface accidents involving more than three days' incapacity, giving a rate of 29.8 per 100,000 manshifts, the highest rate since 1955.

These consisted as follow:—On railways, sidings, tram and tub tracks, 4.2; by machinery, 2.1; use of tools and appliances, 4.4; handling materials, 4.9; stumbling, falling, and slipping, 8.2; all other surface accidents, 6.0.

In fairness, it should be stated that these rates are slightly inflated by the inclusion of underground workmen who were injured on the surface. Most of these were cases of stumbling and falling in the pithead baths or in the colliery yard.

Needless to say, we are by no means satisfied that everything possible is being done to improve safety in mines and quarries, but we have no spectacular solution for the many problems involved. Progress will have to come the hard way, chiefly by an improvement in standards and also by a determination not to allow safety to lag behind when new techniques are introduced to mining engineers.

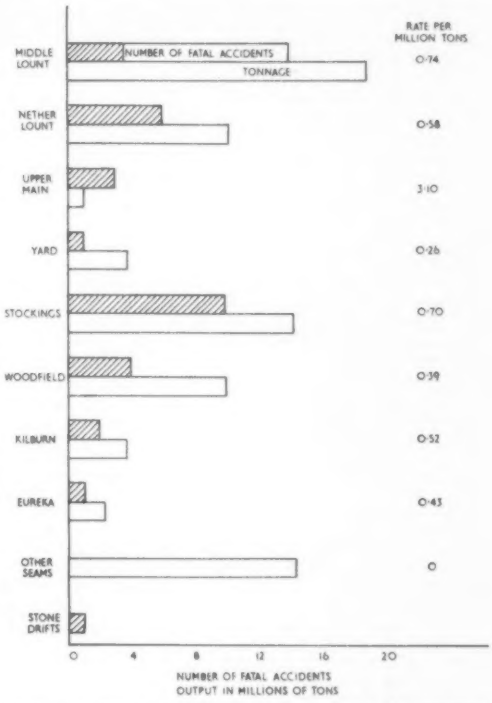

FIG. 7.—FALLS OF GROUND FATALITIES CLASSIFIED ACCORDING TO THE SEAM IN WHICH THEY OCCURRED.

Now is the time to say a few words about the great imponderable, commonly known as the "human element." Here is a factor which cannot be measured, although its effect is reflected to a large degree in all the statistics we have quoted.

It is largely a question of "morale," which may depend on labour relations, natural conditions, geographical distribution of workmen, incidence of minor ailments, and a host of other factors. Moreover, the effect of these factors varies according to the temperament of individuals. For example, adverse conditions cause some men to exaggerate minor injuries others become worried and, consequently, more accident prone, while in many cases the conditions appear to act as a spur to alertness and safety consciousness.

We cannot at this stage introduce even a summary of the innumerable papers which have been written on the psychological causes of accidents. A notable paper by Sir Andrew Bryan will no doubt be remembered[3]. The subject is very involved and certainly controversial. The term "accident prone" is in some quarters regarded as a slur on the character of workmen so classified. Nevertheless, it has been pointed out in a report on industrial accidents[4] that three quarters of all accidents happen to fewer than one quarter of the industrial workers exposed to the dangers.

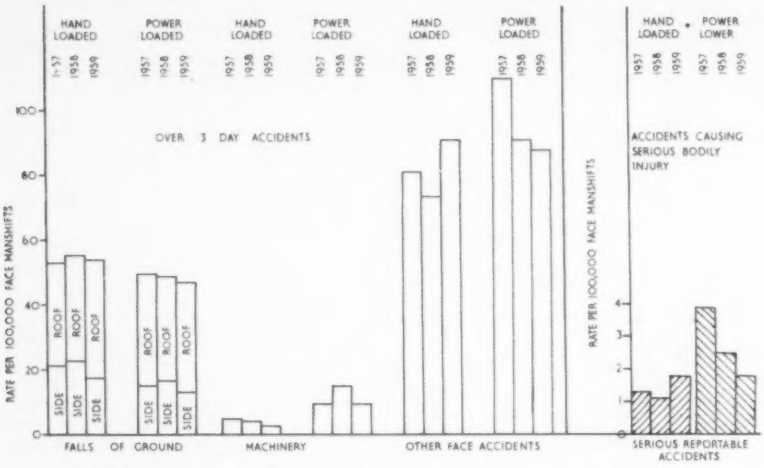

FIG. 8.—COMPARISON BETWEEN ACCIDENT RATES ON HAND-LOADED AND POWER-LOADED FACES.

A study made in another Area found that accident-prone miners appeared to fall into two groups according to age. The younger men were not quick at spotting when danger threatened, whereas the older men were quick enough to see the danger, but not quick enough at getting out of the way. A further point was made that the accident prone are not a fixed group, but a shifting one, with new people constantly leaving or joining. Sometimes worry, anxiety, or discontentment may pre-dispose a person to accident, and the removal of these factors may have the effect of taking a person out of the accident-prone group.

Further progress in accident prevention thus depends on two main lines of approach—the physical aspect and the psychological aspect.

All possible physical precautions must be taken to protect people from the hazards of their work, and all dangerous places, materials, and machinery made as nearly foolproof as possible by guards, fences, and various safety devices. More use should be made of protective clothing. The requirements of the Mines and Quarries Act and Regulations must be pursued with renewed zeal.

But the psychological factor cannot be disregarded and may have a more fundamental effect than is generally realized. The three main psychological causes of accidents are:—(*a*) Ignorance and inexperience; (*b*) the tendency to do things the easiest way, and (*c*) over-confidence and complacency.

Training, in every sense of the term, is the only way to dispel ignorance and there is no doubt that the various training schemes in the industry are making a valuable contribution to safety. A serious accident to a juvenile is a particularly regrettable and often tragic event and special focus is rightly directed on to such an occurrence. The frequency rate is no higher among juveniles than among adults and figures examined indicate that it is rather lower, but there is reason to suspect that a proportion of the trainees are apt to forget quickly what they have been taught so far as safety is concerned and some form of "follow-up" might be helpful.

The tendency to do things the easy way rather than the safe way is a universal failing and it is therefore most important that everything possible should be done to make the safe way at least as easy as the unsafe way. Exhortation is usually fruitless if a few minutes can be saved by taking a risk.

Over-confidence and complacency are the basic causes of numerous accidents which give rise to the saying "familiarity breeds contempt." Unfortunately, this attitude has a cumulative effect; an individual may take the same risk scores of times without injury but eventually the law of averages catches up with him and an accident results.

Examination of the accident rates at individual pits shows that certain collieries maintain a consistently lower rate than others even though the natural conditions and other physical features are comparable. This leads one to believe that more attention is paid to the human problem at some pits. This may take the form of a close and careful follow-up of each accident, the encouragement of men with minor injuries to make full use of the medical facilities provided, and the provision of alternative employment in suitable cases. Painstaking attention to these points over a lengthy period may establish something of a tradition which will keep the accident rate below the average figure for the Area.

Above all, good supervision is the key to success if a further advance in safety is to be made.

Conclusion

The facts about accident rates and trends have been stated, and the picture is somewhat disappointing. Nevertheless, there should be little cause for gloom or despondency when considering the safety aspects in this coalfield. There is solid ground for expecting that the measures which have been taken and the increasing interest in safety will bear fruit in the future.

It has been pointed out that, in many instances, a serious and sustained drive to correct an adverse trend has achieved worthwhile results. These instances include the efforts to reduce accidents at roadheads by improved methods and greater

stability of supports; constant reminders to coal-cutting and power-loading teams, which have undoubtedly helped to make personnel more safety-minded; the drive for improved guarding and fencing of machinery which, in many cases, has reached a high standard.

The extent to which No. 7 Area of the East Midlands Divisional Coal Board has pioneered in the introduction of new types of machines and new techniques is not recorded in statistics, but it has been noted that often a change in methods and equipment has led to a temporary rise in the accident rates. The subsequent fall indicates that corrective measures were taken, and is also indicative of an adaptable labour force.

When these factors are considered, together with the promising trend on mechanized faces, a degree of optimism with regard to the future may be justified. Increased mechanization, not only on the face but elsewhere underground, is proceeding rapidly, and if a favourable accident trend can be maintained in relation to new installations then the next few years should show a definite reduction in overall accident rates.

Accident Rate in Quarries

While the members of the association are not normally associated with quarries, it should be remembered that HM Inspectors of Mines and Quarries are concerned with them, and approximately 250 quarries are working in this district. The film-strip slides of the Ministry of Power entitled "Good Practice at the Quarry Face" are a guide to the treatment of the subject and it is thought that there may be interest in the portraying of unfamiliar problems with lessons to be gleaned, which may have a bearing on safety on the mine surface.

The accident rate for fatal and serious bodily injury per 1,000 persons employed is only slightly less in quarries than in mines, and the fatality rates are almost equal. This may seem surprising when it is considered that all falls of ground are falls of side, there being no roof to contend with. The reasons for this high rate evidently lies in certain special hazards, which are either peculiar to quarries or are more likely to be met with during quarrying operations.

The authors wish to thank HM Chief Inspector of Mines and Quarries and Mr. W. Unsworth, general manager of No. 7 Area of the East Midlands Division of the NCB, for permission to read this paper. Opinions expressed are those of the authors and not necessarily those of the National Coal Board or the Ministry of Power.

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[3] Bryan, Sir Andrew M., D.Sc., LL.D., M.I.Min.E., F.R.S.E., 'Accidents in Coal Mines: a New Line of Approach," Poole Lecture, Kings College Mining Society, Newcastle-upon-Tyne, Vol. 24, 1954, pp. 41–58.

[4] Report on accident prevention entitled "Continuing Toll of Accidents in Industry—Attention to Psychological Causes."

DISCUSSION

MR. H. B. BENNETT was interested in the point brought out by the authors concerning the high rate of fatalities at the waste edge, especially when coupled with a study of Fig. 7. The suggestion, made with some caution, was that caving might be safer than strip packing. Having regard to the number of men exposed when packing in thick seams, and the hazard of packers exposing themselves under the lip edge to obtain stone, Mr. Bennett asked the authors if they would recommend a trial of caving, even in the Stockings Seam.

Replying, MR. CHAPLIN said the point was made in the paper that more packers were fatally injured than strippers, but it must be remembered that total caving of the waste was a comparatively recent innovation. Another significant fact was that, during the period under review, there was not one accident causing fatal or serious bodily injuries to persons engaged in waste-edge operations where caving was practised.

With caving in thick seams, particularly the Stockings Seam, the nature of the overlying strata was important and strong rock was normally positioned a few feet above the Stockings Seam. He remembered partial caving experiments carried out at Donisthorpe Colliery in that seam without any success, strip packing having been resorted to and continued. The problem of whether the waste must be caved or strip packed was often solved by trial and error, and many present would remember that it was not thought feasible to cave the lower Main Seam waste in the Leicestershire Coalfield, but it had been done at one of the mines in conjunction with power loading at the face.

MR. MITCHELL said caving was bound to be more difficult in a thick seam, but much would depend on the nature of the roof. With a friable roof it might be successful, but in the Stockings Seam there would be a tendency for the roof to hang up in the waste. Provided the roof could be regularly and effectively brought down behind the waste-edge chocks it would be worth a trial.

MR. S. A. MCKEE asked if the authors could give some indication as to which was the safest power loader in respect of accidents. MR. CHAPLIN said they had not gone into this question thoroughly and, therefore, it would not be wise to offer any comment.

MR. R. C. STORER asked if there was any information as to the general effect of improved manriding facilities on the accident rate. MR. CHAPLIN, in reply, said that it would be difficult to draw any conclusions from figures produced because many other factors would need to be taken into consideration. MR. MITCHELL added that manriding facilities were bound to be a benefit, particularly in respect of stumbling and falling accidents, whether the manriding was by vehicle or by belt riding under proper safeguards.

MR. W. WOOD, after congratulating the authors, asked if consideration was given to extending the comparison of accident rates, since accident rates were the most important aspect of the statistical analysis. On the question of power loading, Mr. Wood was sorry to say that the accident rate at the face for power loaders was very much higher than with conventional working. In the East Midlands Division, the fatality rate was five times as high at power-loader faces compared with hand-filled faces and three times as high for serious inquiries. Reference had been made to protection on the face side of conveyors and at the waste side. MR. WOOD said they were having more difficulty with the trepanner than with other machines because more men were going on to the face side of the conveyor where there was more risk. On the use

of ploughs used behind trepanner machines, he asked if the plough being tried at New Lount Colliery was one for general application to be employed throughout the division. He also thought the problem of failure of the human element applied to officials as well as workmen.

In reply, MR. CHAPLIN said the accident rates on power-loader faces as compared with those on orthodox faces had been emphasized, and one of the most important points to stress was that accidents caused by falls of ground had been reduced, but accidents caused by machinery had increased. Mr. Wood was quite right in stressing that officials should set an example to the workmen, and this should also apply to senior officials.

With regard to the question of rates, MR. MITCHELL said they were confined mainly to the compensable accidents because they were more accustomed to using rates for compensable accidents, but so far as the "reportables" were concerned the graphs showing rates would not vary very much from graphs showing actual numbers during the period under review; the annual number of manshifts did not alter appreciably.

The need for devising means of avoiding having a man cleaning up behind a trepanner was certainly pressing. Two recent reportable accidents in the Area, which were not included in the statistics quoted, served to emphasize the importance of this. The method used at New Lount, whereby the gummings were pushed back into the undercut when the conveyor was snaked over, was very promising and capable of wider application. Where there was a hard floor the Langton plough was successful, but in this coalfield where floors were usually soft, considerable modification would be required.

MR. M. G. THOMAS said if the divisional accident figures for 1959 were analysed it would be found that the total accidents, that was the accidents causing both fatal and serious bodily injuries, were much the same as the previous year, but the number of fatal accidents was considerably less. He asked if the authors had examined the trend in severity of injuries and also taken into account the effect of improved first-aid, medical centre, and post-accident treatment.

Replying, MR. CHAPLIN said the point was most important and, during the 10-year period under review, the number of fatalities was as shown in Fig. 2. Statistics showed that the severity rate was falling, but the number of accidents causing serious bodily injury had risen. One of the major problems in the district was the accidents caused by falls of ground, which amounted to 71.2 per cent. of the total.

Replying further, MR. MITCHELL said if Mr. Thomas meant the length of time men were off work in respect of individual accidents and the proportion which were permanently incapacitated, they had not pursued this question to the point of being able to quote statistics, but it was apparent that a large proportion of the more recent reportable accidents had broken legs. Improvement in first-aid facilities and post-accident treatment must have a beneficial effect on severity generally and there was no doubt that prompt action by trained first-aid men had saved lives.

Accidents by Age Groups

Concerned with the high trend of accidents between the age groups 26 to 55, MR. J. R. GIBSON asked if the accidents within these groups could not be caused by the fact that these were the most physically active men working in places with potential hazards.

When considering the importance of hydraulic supports, and comparing accident rates on conventional and power-loaded faces, Mr. Gibson said the manpower density was greater on conventional faces. He asked if the authors agreed that greater consideration should be given to the use of hydraulic supports on conventional faces. In places where severe falls of ground occurred how could the voids be consolidated?

In reply, MR. CHAPLIN said it was probable that those age groups mainly contained those persons doing active work at the coal face. In order to examine the position fully it would be necessary to take into account the numbers and occupations of the persons concerned, then a clear picture could be obtained.

There were certain advantages and disadvantages when using hydraulic supports which were too lengthy to discuss. There were benefits to be obtained from their use on all faces provided the system of support was in line with good practice and the prop density was improved. Such supports must also be maintained properly and an important feature was that they were capable of being pre-loaded.

The reference to cavities in the roof formed by falls of ground needed little comment except that, to remove the hazard, it was important to ventilate them and fill them up as soon as possible.

MR. MITCHELL added that, with regard to power-loaded faces, it was true there were fewer men at risk, but the accident rate tended to be somewhat higher. If the number of men could be reduced still further for the same amount of tonnage there would be less men on the face and more on "others underground."

Use of Vermiculite Concrete

In a further question by MR. J. R. GIBSON, on the problem of filling roof cavities, MR. CHAPLIN said the hazards associated with roof cavities were now well known to mining engineers and it was important that care was taken in ventilating a roof cavity so that the firedamp was safely removed and diluted. It should be remembered that Vermiculite concrete had been successfully used to fill extensive and difficult cavities.

MR. L. J. MILLS said training was part of the normal management function and should be carried out during day-to-day supervision. There was some danger that training for safety may be regarded as separate and distinct from normal production, but, as the authors stated, good supervision was vital if further improvements to safety were to be made. He asked if dealing with the method of inculcating the right attitude of mind to safety, the authors would give their opinion on the scheme of panel investigation of accidents, and did they consider that they materially assisted in the drive for increased safety?

Replying, MR. CHAPLIN said that a similar scheme was adopted some time ago by the management of a large group of quarries and the results so far had proved to be well worthwhile and beneficial to the safety drive.

MR. MITCHELL said they had only a very limited experience of the panel investigation system in the Area. There was only one pit operating it in accordance with the original scheme. He was very much in favour of the system, but owing to its very restricted operation it was not possible to arrive at any definite conclusion so far as actual results were concerned. It was bound to spread safety consciousness to a greater number of men than would otherwise be interested. One of the troubles of the safety committees was that, although the members were interested, it was difficult to get the feeling down to the rank and file; the panel system was one way of doing this.

MR. D. HARPER, commenting on accidents caused by stumbling and falling, handling of materials, and haulage, said one of the reasons for this was the difficult walking conditions experienced in present

mining systems. The difficulties associated with haulage and transport conditions was impressed upon him following a visit to an anhydrite mine owned by Imperial Chemical Industries, Limited, at Billingham. The method of haulage and transport there had been changed from conventional mining with conveyors and tubs, to a system employing diesel rubber-tyred trucks. The economics effected were such that about 30 per cent. of the persons employed at the mine became redundant by the reorganization. The outstanding feature, however, was the ease in which walking was accomplished underground and the safe method of transporation of persons. Mr. Harper was sure that more attention given to floors which were constantly being used by persons would repay by fewer accidents. Hard, flat surfaces also made a contribution towards the reduction of air pollution by dust raised into the air.

MR. CHAPLIN said, at the anhydrite mine in question, the structure of management was rather different to that appertaining in coal mines, and it was possible that supervision was more effective to fit in with the method of working employed.

Japanese Steel for Brazilian Ore

Exports of Japanese steel to Brazil in exchange for iron ore have been proposed by Brazil and the proposal is now being studied by the main steel companies, it is reported. It is suggested that Japan should send to Brazil 160,000 tons of steel ingots next year, 200,000 tons in 1963, and 50,000 tons in 1964. Brazilian ore shipped in exchange would contain more than 66 per cent. Fe.

GOLDEN JUBILEE OF

Padley & Venables

FOUNDED in May, 1911, by Richard Padley under the title of R. Padley & Company and with a capital of £200, Padley & Venables, Limited, which now incorporates Rip-Bits, Limited, is celebrating its golden jubilee this year. The company has its head office and main works at Dronfield and another works at Aldridge, near Walsall. Richard Padley, who was 35 when he went into business on his own account, died in January, 1957, at the age of 81. He remained a director up to his death and, in spite of his opposition to the building of the Dronfield works, he saw its completion and finally accepted it as a great achievement.

In 1918, Mr. Padley was joined by Thomas Edward Venables and in March, 1920, the present company of Padley & Venables, Limited, was formed as a private limited company. Mr. Venables, who retired from the company in 1945, died in 1956 at the age of 78.

There are many names and events in the history of Padley & Venables worth recording, and this is done in a very readable way in a booklet published in celebration of the golden jubilee. Responsible for the compilation of the booklet were Mr. George A. Morgan, managing director, and Mr. Bernard Swift, a director of the company.

New Report on US Energy Resources

DETAILS of the production and consumption of all forms of energy used in the US are given in a report published by the Bureau of Mines. The new statistical publication presents a comprehensive view of the source of US energy materials, what happens to them as they flow from producers to consumers, and how they are finally used.

Based on data obtained from the census of manufacturers and mineral industries in 1954 and other sources, the report contains information on coal, petroleum, natural gas, wood, and all derivatives of the various forms of energy. All energy forms are discussed in terms of inherent-heat value so that comparisons can be made.

The report is one of a series presenting results of studies in energy economics begun by the Bureau of Mines more than 10 years ago. However, the current one is considered the most comprehensive and significant report in the series. It is expected to become a valuable reference work for research economists and for others concerned with the relationship between energy resources and industrial and economic growth.

Included in the report are several charts picturing the flow of energy materials within the US economy and showing the relative amounts of each material that are produced, imported, exported, used or lost either in primary production or in conversion to secondary energy products such as coke, petroleum, etc., and consumed by various economic sectors. Typical of the information developed in the study and presented in charts, tables, and text are the following:—

(1) Of the total energy supply in 1954 in the US, petroleum represented 38 per cent.; natural gas, 29 per cent.; coal, 27 per cent.

(2) Major energy-consuming sectors of the economy in 1954 were residential and commercial (25 per cent. of domestic consumption), manufacturing, excluding industries that convert raw energy into secondary forms like petrol, coke, etc. (21 per cent.), and transportation (20 per cent.).

(3) Nearly 17 per cent. of the total energy supply was used or lost by the industries that produced the energy or converted it to secondary forms.

A copy of report of investigations 5821, "Energy Production and Consumption in the United States: An Analytical Study Based on 1954 Data," by Perry D. Teitelbaum, can be obtained from the Bureau of Mines Publication-Distribution Section, 4,800, Forbes Avenue, Pittsburgh 13, Pa. Persons requesting the report should specify its number and title.

Qualter, Hall Shuttle Cars for United Steel

AS part of its programme of increased steel production, the United Steel Companies, Limited, has placed orders with Qualter, Hall & Company, Limited, Barnsley, for nine shuttle cars for service in the ironstone mines at Dragonby and Stanton, near Scunthorpe. Qualter, Hall has also been asked to commence work on a further batch of vehicles for these mines, and it is expected that the contract for these cars will be finalized shortly.

These orders are the outcome of the supply of a prototype Qualter, Hall shuttle car to the United Steel Companies a few years ago: the original car has been thoroughly tested and proved, and the cars now ordered are of similar general design except that they will employ battery-electric traction equipment in place of the diesel-electric system employed on the prototype.

The capacity of the Qualter, Hall car is 15 tons of ironstone, which can be carried at a maximum traction speed of 4 m.p.h. Designed specially for operation in the conditions encountered in ironstone mines, ground clearance is 18 in. at the lowest point and as much as 2 ft. at the discharge end. The hopper running down the centre of the car is equipped with a round-link type scraper conveyor powered by twin 16½-h.p. motors which enable a high rate of discharge to be achieved; identical motors are used for the traction drive. Two particularly noteworthy features of the design are the power-operated steering and servo-assisted disc brakes, both of which will considerably reduce driver fatigue.

QUALTER, HALL PROTOTYPE DIESEL-ELECTRIC SHUTTLE CAR.

The batteries powering these vehicles will be of the new high-capacity type (854 amp.-hr.) recently introduced by Chloride Batteries, Limited, which will usefully extend the duty period between battery changes.

The supply of shuttle cars for ore mining marks the entry into a new and expanding market by Qualter, Hall. The company's activities have previously been concentrated on coal-mining and pneumatic control equipment. Although shuttle cars have been used for many years in mines in various parts of the world, Qualter, Hall is the first British firm to enter this market, which has been dominated by American manufacturers.

Corrosion in Nuclear Energy Industry

ORGANIZED by the Société de Chimie Industrielle, a symposium on "Corrosion in the Nuclear Energy Industry" is to be held at the Maison de la Chimie, Paris, on October 19 and 20. The programme is particularly concerned with corrosion in sheath materials. It forms the 16th manifestation of the European Federation of Corrosion. The following papers will be presented: —

"Researches on the Corrosion of Zirconium Alloys in Superheated Steam," by Dr. U. Rosler; "Corrosion of Zirconium and its Alloys in Steam," by J. N. Wanklyn; "Study of the Effect of Various Factors (Thermal Flux, Vibrations, Pressure Addition of Lithia) on the Corrosion on Zircaloy by Water or Steam at High Temperature and the Absorption of Hydrogen by the Metal," by H. Coriou, L. Grall, J. Hure, M. Pelras, and H. Willermoz; "Corrosion Behaviour of Niobium Alloys and Inconel, Used, Respectively, as Sheathing Materials and Structural Materials in Pressurized Water Reactors," by Warren E. Berry.

"Oxidation at High Temperature and Conditions of Inflammability of Magnesium-base Sheathing Alloys in Great Britain," by C. Tysack and P. B. Longton; "Corrosion of Beryllium in Carbon Dioxide Under Pressure at High Temperature," by R. Darras, D. Leclercq, and B. Dewanckel; "Galvanic Corrosion Effects During Storage Under Water, After Discharge, of Combustible Elements Sheathed with Aluminium," by H. G. Masterson and J. T. Harrison; "Study of Corrosion Factors of Beryllium in Carbon Dioxide," by A. Draycott, F. D. Nicholson, G. H. Price, and W. I. Stuart.

Full information concerning the symposium may be obtained from the Société de Chimie Industrielle, 28, rue Saint-Dominique, Paris (7e). Completed application forms must be returned by October 2.

LEAD PRODUCTION in Canada during 1960, at 204,907 short tons, was 18,211 tons higher than in 1959.

The problem of maintaining the competitive position of the open-hearth furnace is discussed with special reference to co-ordination and acceleration of the heating and oxidation processes in this paper by A. Donald, T. Urie, B.Sc., D. Hadfield, M.A., and I. M. Mackenzie, B.Sc., all associated with Colvilles, Limited. The paper was presented to the West of Scotland Iron and Steel Institute on April 24. The dependence of transfer of heat and oxygen on agitation of the charge and the mechanisms of stirring are also discussed, and the problem of predicting conditions at melt-out is considered, as are also various ways of increasing the production rate by accelerating heat input and increasing the stirring action.

HEATING AND OXIDATION IN THE BASIC OPEN-HEARTH PROCESS

Problem of Competing with New Processes

HAVING maintained a dominant position in British steel production for over 50 years, the basic open-hearth process has now to face competition from improved pneumatic and electric-furnace processes. Indeed, it is doubtful whether the conventional open-hearth process will long remain competitive. However, in view of the very large capital investment involved, any steps that can be taken to improve its efficiency will be of immediate importance to the British steel industry.

Among the reasons for the widespread use of the basic open-hearth process are its economy, flexibility, and relative ease of control to produce high-quality steels. In the past the pneumatic processes such as the Bessemer, though economical, have been unsuitable for the production of high-quality steel, while the electric process, though offering the best facilities for control, could not compete economically for the production of tonnage steel. Furthermore, the raw materials for steelmaking normally consist of from 30 to 70 per cent. steel scrap, the balance being metal from the blast furnace. Open-hearth furnaces can operate with any proportions of scrap and iron within this range, whereas neither the pneumatic nor the electric-furnace process alone can utilize a mixture of scrap and iron in the proportions available. However, now that both these processes are overcoming their other disabilities it should be possible to use an appropriate combination of them to deal with any burden, as is illustrated diagrammatically in Fig. 1.

Steelmaking involves the heating of the charge and the removal of carbon and other impurities from it by oxidation. For economic operation the heating and oxidation processes must proceed rapidly and their progress must be co-ordinated.

In the open-hearth process co-ordination of heating and oxidation presents particular problems because a great part of the oxygen required for refining the charge is absorbed from the furnace atmosphere, and because the rate of heat input is limited by the blanket of slag overlying the metal. Since neither heating nor oxidation is readily controlled, the co-ordination of the two processes is correspondingly difficult.

In contrast, refining in the new pneumatic pro-

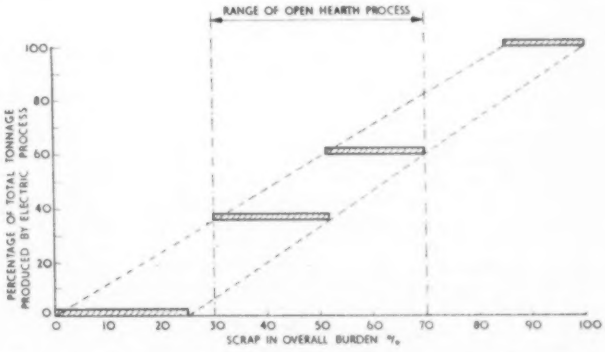

FIG. 1.—RANGE OF BURDENS POSSIBLE IN A PLANT USING BOTH ELECTRIC AND PNEUMATIC FURNACES.

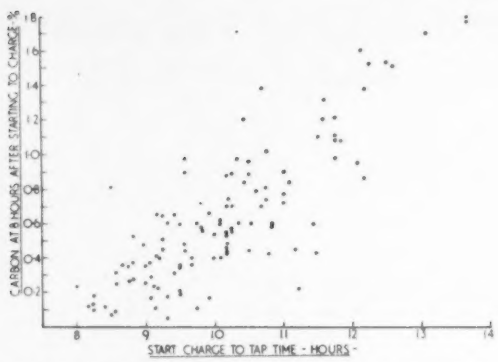

FIG. 2.—EFFECT OF UNDER OXIDATION ON PRODUCTION RATE.

cesses is brought about by the direct introduction of measured quantities of oxygen to the metal, heat being generated within the charge by the exothermic oxidation of impurities. In the electric-arc process oxidation is accomplished by the addition of a measured quantity of iron oxide, atmospheric oxidation being negligible, while heat input is exceptionally rapid and easy to control.

Failure to achieve co-ordination of oxidation and heating in the open-hearth process has two main effects. It may prolong the working of the charge and so increase production costs. It may also adversely affect the quality of the steel produced, increasing subsequent processing costs and rejections. The loss of furnace time attributable to under-oxidation is illustrated in Fig. 2, in which the carbon content 8 hr. after the commencement of charging is plotted against total furnace time, the carbon content providing a measure of the extent to which oxidation has progressed. The effect of failure to co-ordinate oxidation and heating on the incidence of ingot defects is illustrated in Table 1. The incidence

TABLE 1.—*Incidence of Ingot Cracking.*

Practice.	Cracking index.		Significance of difference.*
	Charges with normal melt-out conditions.	Charges with soft melts or late hot metal addition.	
Hot metal (tilting), trial (1)	21	31	0.15
trial (2)	20	27	0.25
Hot metal (fixed),			
18-ton ingots	27	39	0.05
13-ton ingots	12	21	0.05
Cold metal (fixed),			
mild steel	53	47	0.04
alloy steel	30	63	0.03

* Student "*t*" test.

of severe cracking is shown to be higher for those charges which were overoxidized before they had attained a sufficient temperature for casting.

The object of the present paper is to discuss the possibilities of increasing the rate and improving the control of oxidation and heating in the conventional basic open-hearth furnace. As far as possible, the discussion is intended to apply to open-hearth steelmaking in general. However, special reference is made to results of a trial carried out to determine how far it might be possible to predict the progress of oxidation and heat input.

General Consideration of the Oxidation and Heating Processes

In considering the absorption of oxygen and heat by the charge, it is necessary to consider the total quantity required, the rate of absorption and the distribution within the charge. The heat requirement of different charges of the same tonnage produced in a given furnace will show little variation. In contrast, the requirements for oxygen may be expected to vary from charge to charge over fairly wide limits due to variations in the metallurgical burden.

During charging heat generated by combustion of fuel is transferred directly to the metal by convection and radiation. During subsequent stages of the process when slag covers the metal, transfer depends on agitation of the charge as the thermal conductivity of slag is low. The transfer of oxygen from the furnace atmosphere to the charge is brought about by processes similar to those operative for heat transfer. However, oxygen may be added to the slag in the form of iron oxide and is also transferred from gas to slag and from slag to metal by oxidation of small globules of metal which are projected out of the metal phase along with the rising bubbles of carbon monoxide during the boil and which subsequently fall back into the metal.

Apart from its influence on transfer, the stirring action controls the distribution of heat and oxygen in the charge. With vigorous agitation heat is used to melt the solid metal before the liquid metal and slag are significantly superheated. On the other hand, if the charge is quiescent, there can be a very substantial temperature gradient set up from the surface of the slag to the hearth, the upper layers of molten metal being superheated while there is still solid scrap in the furnace. If the charge is well stirred during the melting period oxygen will be used to oxidize metalloids and remove carbon, whereas in the absence of stirring, a considerable proportion of the oxygen will go to increase the oxide content of the slag.

From the foregoing discussion, it is obvious that a key to the understanding of the rate of reactions in the open-hearth process is the stirring which may be brought about by one means or another within and between the metal and slag layers.

Oxidation.—A factor of major importance which determines the total quantity of oxygen required to refine the metal is the metallurgical burden as defined by the quantity of carbon, silicon, phosphorus, and manganese. If sufficiently accurate information is available, compensation may be made for variations in metallurgical burden by charging more or less of either iron oxide or carbon as appropriate. The most important source of variation in the metallurgical burden is usually

variation in the composition of metal from the blast furnace and unless due compensation is made for this, erratic oxidation conditions can hardly be avoided.

During charging and melting the charge absorbs a very large quantity of oxygen from the furnace atmosphere, the rate of absorption depending on the oxygen content of the atmosphere, the nature of the scrap and the charging procedure. Light, bulky scrap, presenting a large surface to the furnace gases, absorbs considerably more oxygen than heavy scrap, which is more rapidly submerged beneath the slag layer. If charging is carried out in such a manner that light scrap is compressed and covered at an earlier stage, oxidation will be correspondingly reduced. In oil-fired furnaces there can be appreciable oxidation due to the impact of steam on the surface of the metal exposed by the jet action of the high-velocity flame. The reaction between iron and steam is strongly endothermic, but owing to the immediate proximity of the flame oxidation by this mechanism is accompanied by rising temperature of the metal. The final source of oxygen is iron oxide added during the latter part of the melting stage of the process or during refining.

Heat Input.—The rate at which heat can be introduced to the charge depends on the rate at which fuel is burnt in the furnace and the efficiency with which the heat generated is transferred to the metal. Both the rate of fuel input and the heat receptivity vary from one stage of the process to another. The heat requirement is influenced by the heat content of hot-metal additions, the thermal effect of chemical reactions, the heat absorbed during calcining of limestone and the heat lost from the metal by conduction through the hearth.

Although the total amount of heat that must be supplied to the metal for melting, superheating, and for the chemical reactions does not vary appreciably from one charge to another, the total amount of fuel required may be very variable depending on the length of time the charge is in the furnace. This is because a high proportion of the heat generated by combustion of the fuel is lost. These heat losses are variable and therefore, even in oil-fired furnaces, where it is possible to measure the rate of fuel input and control it to a predetermined figure, it is not possible to determine accurately the rate at which heat is being supplied to the charge.

In gas-fired furnaces the problem is very much more complicated by the fact that the fuel is difficult to meter and its calorific value may be variable. During charging the heat receptivity is relatively high and can vary significantly from one charge to another, depending on the type of scrap and the charging procedure. During the melting period the efficiency with which the heat is transmitted to the charge is even more variable as it depends to a great extent on the degree to which the molten charge is agitated. In order to melt the scrap, heat is transferred through the slag layer by convection, molten slag being virtually opaque to radiant heat and having a low thermal conductivity. In the absence of agitation, heat transfer is very slow.

Mechanisms of Stirring.—Agitation of the charge is important, not only for heat transfer and to hasten the completion of melting, but also for the chemical reactions. There are a number of mechanisms responsible for agitating the charge and their relative importance differs from one practice to another and from one stage of the process to another.

A powerful mechanism having its effect principally on the slag layer is the force of the flame. In gas-fired furnaces the stirring action, though by no means insignificant, is undoubtedly much less than in oil-fired furnaces, where flame velocities are very high. In cold-metal practice the stirring action of the flame during the melting stage of the process is probably the major factor determining the rate of heat input and oxidation. Even in hot-metal practice it has been possible to demonstrate the influence of flame velocity on the rate of heat input and on the temperature distribution. It was found that with a high flow of atomizing steam the rate of temperature rise of the charge increased so that the time to completion of melting was reduced while the temperature gradient through the slag and metal tended to be lower at the completion of melting.

The principal mechanism for producing agitation of the charge in the open-hearth process is the evolution of carbon monoxide gas. Bubbles rising through the metal and the slag impart an upward movement to the liquid phases and also, by reducing the effective density of the liquid, cause differences in levels which produce lateral flow. The amount of stirring action depends on the number and size of the bubbles, the depth at which they are formed and their distribution. The efficiency of the stirring action may be assessed in terms of its effect on the progress of the working of the charge. Stirring has the most desirable effect when it results in bulk transfer in a vertical direction.

Owing to the effect of surface tension, the pressure within small bubbles is very high so that nucleation can only occur within the liquid phase if the carbon/oxygen product is exceptionally high. Nucleation can occur more readily at a solid surface, particularly if this is rough. Conditions for bubble formation are relatively favourable on the dolomite hearth of the furnace and therefore during the refining boil bubbles are evolved from hearth level. If the boil were completely uniform over the hearth area less stirring action would be expected but, in fact, the boil is not uniform, there being certain localities in which carbon elimination occurs preferentially.

The most likely explanation is that where the boil is most vigorous there is an upward movement of metal which is heated when its comes adjacent to the slag layer. This metal will then flow parallel to the slag surface absorbing oxygen and, at a relatively quiescent part of the bath, sink to hearth level. The carbon/oxygen reaction being exothermic, the equilibrium is affected by temperature so that the equilibrium product required to

produce a given partial pressure is lower as the temperature is reduced. Thus the metal sinking to hearth level does not react immediately to generate carbon monoxide but flows towards the area of active boil, losing heat to the hearth as it goes. Arriving at the active zone at a lower temperature, it will help to perpetuate the localized nature of the boil.

If the hearth is covered with a layer of steel scrap, conditions are much less favourable for bubble formation, not only because the surface is smooth and the contact angle less favourable, but also because the concentration of carbon and oxygen in the adjacent molten metal is being continuously reduced. If the metal and slag are relatively quiescent a very high oxidizing potential may be built up in the slag and in the layer of metal immediately adjacent to it. The slag/metal interface then offers a relatively favourable site for the carbon/oxygen reaction and, as shown in Fig. 3, gas bubbles formed will be retained at the interface by surface tension until they exceed some critical size. This effect is of practical importance as, if the surface tension effect were small, the bubbles would rise into the slag layer while they were still minute, and the reaction would be very slow. Thus it is possible to have the carbon/oxygen reaction proceeding at the slag/metal interface in such a manner as to result in appreciable loss of carbon and with little stirring action.

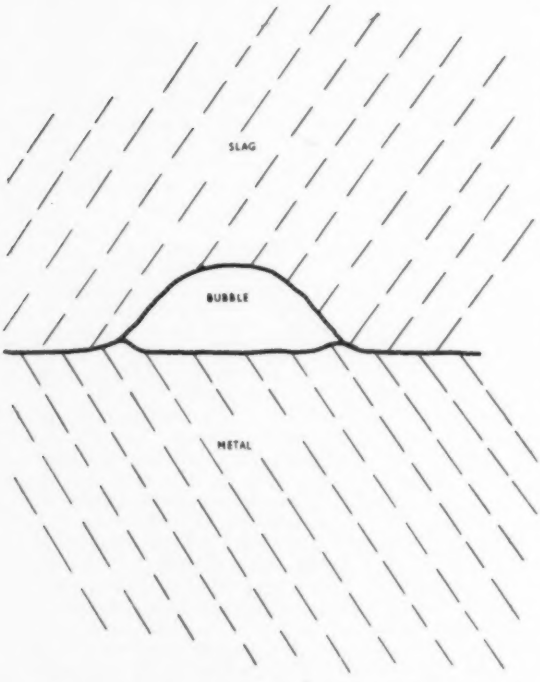

FIG. 3.—GAS BUBBLE HELD AT SLAG/METAL INTERFACE.

The occurrence of a boil of this nature is readily detectable in a quiescent charge, where numerous small bubbles are seen evenly distributed over the surface of the slag. If iron oxide is added before melting of the scrap is completed the slag/metal interface reaction may be accelerated locally producing some stirring of the slag (though not of the metal). The iron oxide, having a higher density than the slag, sinks to the surface of the metal where it reacts. The slag layer being the main barrier to heat transfer, such stirring has a significant effect.

In hot-metal practice very vigorous gas evolution occurs because of the reaction between the blast-furnace metal and iron ore which has been charged beneath the scrap. Such an ore boil generates a very vigorous stirring action for a loss of comparatively little carbon. Where limestone is charged in place of burnt lime, progressive calcination produces a useful stirring action as well as oxidation. However, as the decomposition of calcium carbonate is strongly endothermic, the use of limestone is only advantageous if a high heat input can be maintained during the lime boil.

If the charge is nearly molten, but one or more large lumps of scrap remain on the hearth, vigorous gas evolution occurs in the vicinity of the lumps of metal due to their effect in reducing the temperature of the molten steel. Such a boil, although giving rise to considerable local agitation, has relatively little influence in stirring the charge and by reducing the concentration of oxygen in the molten steel prevents the initiation of a general refining boil. It is observable that when melting of such isolated lumps of scrap is completed, a general boil commences almost immediately with a marked increase in the rate of heat acceptance.

Co-ordination of Heating and Oxidation Processes up to Melt-out

The stage of the process at which all the scrap is melted and the refining boil commences is referred to as melt-out. Melting is completed when a sufficient quantity of heat has been transferred through the slag and molten metal to the hearth level. The time to melt out may therefore vary and this will result in a variation in the degree of oxidation at melt out. This latter parameter is also influenced by the oxygen requirements and the rate of oxygen pick-up. The distribution of heat and oxygen in the charge at melt-out is also dependent on the efficiency of stirring. The condition at melt-out may thus be defined in terms of the carbon content of the metal, the percentage of iron oxide in the slag (both of which are indicative of the state of oxidation) and the metal temperature. As the controlling factors, heat input, oxygen pick-up, and stirring are interdependent, the relationship between melt-out conditions and the variables defining furnace operation are very complex. The general type of relationship is illustrated in Fig. 4.

Optimum agitation and co-ordination of the heating and oxidation processes would result in the last traces of scrap being melted as early as

possible with the minimum superheat in the metal. The slag would contain only a moderate content of iron oxide and the carbon content of the metal would be just sufficient to permit a vigorous boil of adequate duration to allow the completion of the necessary refining reactions and the superheating of the steel for casting.

Considerable charges in which heating conditions have been normal, but oxidation abnormal, Fig. 4 shows that underoxidation gives a high carbon content at melt-out, the removal of which results in the loss of furnace time. Slight overoxidation may be expected to give a very fast working charge, but if overoxidation is considerable, carbon will be lost by reaction at the slag/metal interface. As this type of carbon boil does not produce significant stirring action, very substantial oxygen and temperature gradients may be established, and in extereme instances there may be complete decarburization without all the charge becoming molten. Where oxidation has proceeded normally, but heating has been delayed, unmelted scrap will remain on the hearth for an unduly long period. The slag will become highly oxidizing and carbon will be lost by reaction at the slag/metal interface. Thus, this condition can also result in there being insufficient carbon in the metal at melt-out to produce a satisfactory refining boil.

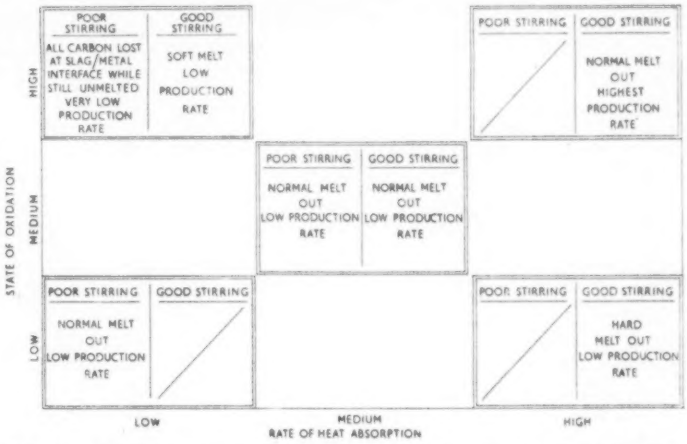

FIG. 4.—RELATIONSHIP BETWEEN OPERATING VARIABLES AND MELT-OUT CONDITIONS.

Abnormally fast heating is a condition unlikely to be encountered, but it might be expected to have no harmful effects as any consequent underoxidation at melt-out could be corrected by substantial additions of oxides, and the production rate should still be high. Simultaneous increase or decrease in the rate of pick up of oxygen and heat will alter only the melt-out time and not produce abnormal melt-out conditions. Thus furnaces with substantially different driving rates can be operated to produce comparable melt-out conditions.

The conditions at melt-out are greatly influenced by stirring during the melting period and the effect may be summarized as follows. If the bath is quiescent melting is delayed and there are substantial temperature gradients through the slag and metal. Oxygen is used to increase the iron-oxide content of the slag, leaving a relatively high carbon content in the steel.

The adverse effects of abnormal melt-out conditions is of the greatest practical importance and must be considered. If the charge is underoxidized, the metalloid content of the steel is relatively high and the content of oxygen low. In these circumstances the rate of transportation of oxygen to the hearth level is slow and so the commencement of the vigorous refining boil which is required to produce the stirring action to aid transfer of oxygen and heat is delayed. Overoxidation results in there being an insufficiency of carbon to maintain a vigorous boil and again there is difficulty in heating the charge.

Prediction of Melt-out Conditions

In order to exercise control of conditions at melt-out it is necessary to predict the effect of variation in charge composition and furnace operating procedure on the melt-out time and carbon content. In order to do this it is necessary to know the quantitative relationships between these parameters and observable factors relating to the materials charged and the operation of the furnace. No universal relationship can be expected to apply to the open-hearth process as operated in different melting shops. The quantitative relationships must be established for each variant of practice. However, it is important to know what can be achieved in this direction under relatively favourable conditions.

With this end in view an investigation has been carried out in a melting shop operating 250-ton capacity fixed basic open-hearth furnaces, fired with fuel oil and working a charge approximately 35 per cent. scrap and 65 per cent. hot metal. Observations were made on two series of casts with and without slag flushing respectively. The trial had the objective of determining how far any variation in melt-out conditions could be related to observable factors defining furnace practice.

The procedure for charging and working the furnaces was standardized as much as possible and observers recorded the factors listed below:—

Scope of Observations During Trial: (1) Weight, composition, and physical state of scrap, oxides, and limestone; (2) weight, composition, and temperature of hot metal; (3) oil, air, and steam flows during charging, melting, and refining; (4) oxygen content of exhaust gases during charging, melting, and refining; (5) roof, chequer, and flue tempera-

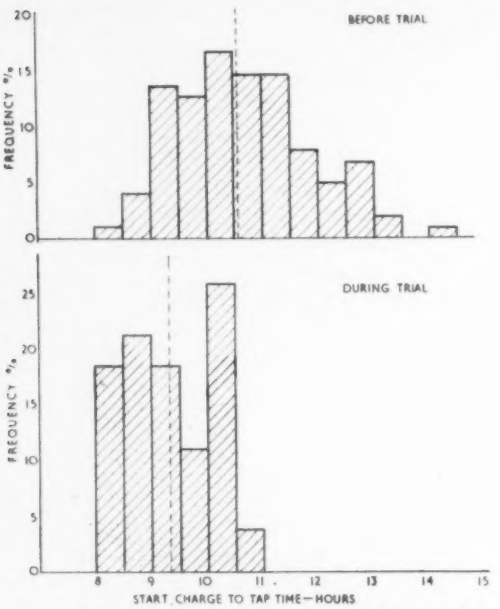

FIG. 5.—HISTOGRAMS OF "START CHARGE TO TAP" TIMES.

ture during charging, melting, and refining; (6) bath temperatures during the latter part of the melting period and throughout refining; (7) slag and metal analyses during the latter part of the melting period and throughout refining; (8) weight of ore, lime, and hot metal fed.

A direct result of the extra attention to standardization of practice was a significant increase in furnace output. This is illustrated by the histograms in Fig. 5, which relate only to flush slag charges.

Despite the extra care taken to standardize furnace operation there was no decrease in the variation of carbon content, slag FeO and metal temperature at melt-out. The degree of variation of melt-out carbon is shown in Fig. 6. This is certainly no worse than is generally achieved in basic open-hearth melting shops, the standard deviation of carbon content at melt-out being equivalent to no more than 3 per cent. of the total oxygen requirement of the original burden.

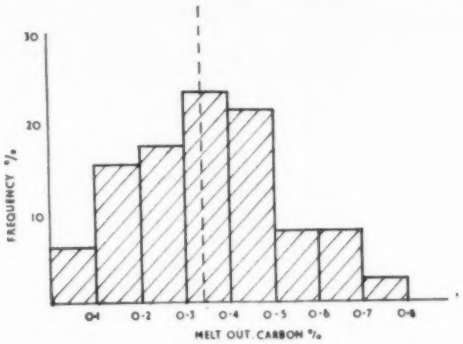

FIG. 6.—HISTOGRAM OF CARBON CONTENTS AT MELT-OUT DURING TRIAL.

However, even this degree of variation in melt-out conditions has an adverse effect on furnace performance during refining.

The next stage in the analysis of the results of the trial was to determine by correlation analysis the quantitative relationships between the above four parameters and the factors defining furnace operating conditions. In Table 2 the relationships found for the flush and non-flush charges are summarized. The simplest way of discussing these results and the procedure most appropriate to the use which might be made of them, is to consider the effect of variation of each of the main operating variables on melt-out conditions. For the purpose of this discussion, the effects are considered on the basis of other variables remaining constant at their mean values.

Composition of the Charge.—An increase in the metallurgical burden increased the time to melt-out. This is presumably attributable to the effect of the thicker layer of slag decreasing the rate of heat transfer to the charge. As an increase in metallurgical burden increased the quantity of oxygen required for refining an adjustment was made to the quantity of ore charged according to the composition of the hot metal. However, the hot metal was charged some time after the ore and was often not of the composition anticipated so that the weight of the ore charged was incorrect. An excess of ore corresponded to a decrease in the carbon content at melt-out and an increase in the iron oxide content of the slag without having any appreciable effect on melt-out time or temperature.

TABLE 2.—*Effect of Operational Variables on Melt-out Conditions.*

Operational variables.	Unit.	Effect of a unit increase on					
		Carbon content.		FeO content.	Temperature, deg. C.	Time, min.	
		Flush.	Non-flush.	Flush.	Flush.	Flush.	Non-flush.
O_2 available from scale, ore and limestone —O_2 equivalent of metalloids in charge	ton	−0.14	−0.06	+1.2			
Oxygen content of exhaust gases ..	1 per cent.	−0.06	−0.06	+1.2			
Rate of steam input during melting ..	1,000 lb. per hr.				−33	−75	−75
O_2 equivalent of metalloids in charge ..	ton					+15	−55
Proportion of fine scrap	10 per cent.			+4.4			

Oxidation.—An increased content of oxygen in the waste gases during the charging and melting period also corresponded to a small decrease in the carbon content at melt-out and an increase in the iron oxide content of the slag. A generally similar effect is found for the proportion of light scrap in the charge.

Heat Input.—Factors such as fuel input, air/oil ratio, etc., being closely standardized, did not cause any very substantial variation in the time to melt-out. However, a factor having a major effect was the quantity of steam used in the oil flame. An increase in steam flow corresponded to a shortening of the melt-out time and a reduction in the temperature of the metal at melt-out. This effect is attributable to agitation of the charge by the jet action of the flame, which increases the rate of transfer of heat and reduces the temperature gradient in the slag and metal. Although the time of melt-out was decreased, the carbon content at melt-out was unaltered confirming that the steam acts as an oxidizing agent and probably increases the rate of transfer of oxygen from the furnace atmosphere.

Effect of Weight of Slag Flushed.—The object of flushed-slag practice is to remove some of the SiO_2- and P_2O_5-rich slag formed during the melting period. Slag flushing improves heat transfer and permits the production of a slag of adequate basicity with economy of lime. Flushing is achieved by making use of the foaming properties of slag high in silica and iron oxide. The slag composition is controlled by putting the limestone beneath a substantial layer of scrap so that much of it does not rise into the slag until after flushing has been completed. The evolution of gas required for the flushing operation arises from decomposition of limestone and from the ore boil.

A major problem with flush-slag practice in a fixed furnace is the difficulty of controlling the quantity of slag removed and its lime content. Thus flushing introduces yet another variable to the process, making the control of slag composition more difficult. Furthermore, variation in the bulk of slag remaining after flushing causes additional variation in the heat receptivity of the charge and the quantity of oxygen required to produce a given oxidizing potential in the slag. However, removing a proportion of the slag has such a beneficial effect on production rate that this is practised despite its disadvantages with respect to control of the steelmaking operation. For example, in this trial the average time from start of charging to tap for non-flush charges was 10 hr. 30 min., whereas the time for flush charges was 9 hr. 20 min.

The removal of slag tends to increase the temperature at melt-out as, with the lower slag bulk, heat transfer to the metal is facilitated, but as the stirring processes leading to equalization of temperature are not affected, a more substantial temperature gradient is produced. Similarly, although the oxidizing potential of the slag is increased, the rate of carbon removal prior to melt-out is not significantly altered.

The prerequisite for control of melt-out conditions is the close standardizaton of all aspects of furnace operation. It is also necessary to take action to allow for observable variation in the nature of the charge and in the operating conditions. This latter aspect of control necessitates full and accurate information and a knowledge of the quantitative effect of the variables.

The heating and oxidizing powers of an open-hearth furnace vary during and between campaigns. The history of previous charges must be examined to see whether there is any evidence of a drift in melt-out conditions attributable to furnace characteristics. The composition of the charge is a major factor determining the oxygen requirement. From a knowledge of the weight and composition of the iron and the composition and nature of the scrap an appropriate adjustment can be made to the proportions of iron and scrap, or to the quantity of iron oxide or coal added with the charge.

Due attention having been given to the balancing of the charge, close control of conditions during charging and melting, with particular reference to fuel input, excess oxygen in the waste gases, the sequence of charging, quantity of steam, etc., is essential and any deviation from specified conditions should be noted. Cognizance should be taken of any late information regarding the composition of the hot metal or the type of scrap charged, etc. If the deviations from the intended conditions are sufficient, corrective action may be taken during the latter stages of charging. In practice most deviations from desired conditions are likely to result in an overoxidized state at melt-out and therefore the action taken would be to increase the quantity of iron charged. In hot-metal practice, delay in covering limestone with scrap may result in partial calcination of the limestone with consequent loss of oxygen from the charge. In certain circumstances this would justify increasing the quantity of ore charged.

After most of the metal is molten it is possible to obtain more or less representative samples which can be used for carbon determination. It is also possible to determine the approximate temperature of the molten portion of the charge. These parameters are indicative of the progress of oxidation and heating and may be assessed along with the history of the working of the charge to determine whether the melt-out is likely to be early or late and the probable state of oxidation. If the evidence points to serious overoxidation it is worth while applying corrective measures before melt-out to ensure good bath action during the refining period. This may be done by adding further hot metal or cold pig-iron. An interesting development referred to in American technical literature[1] but not yet adopted in this country is recarburization by the injection of finely powdered graphite into the metal. This has obvious advantages over additions of blast-furnace metal, as the chilling effect of the addition is minimized and there is no increase in the quantity of metalloids to be absorbed in the slag.

A completely reliable indication of under-

oxidation at melt-out is difficult to obtain as, even if the temperature is high, there may be a considerable amount of unmelted scrap on the furnace hearth. By the time this scrap is molten the carbon content may have been reduced to a normal level. Unless evidence of underoxidation is conclusive it is generally preferable to wait until melt-out before taking corrective action. If furnace conditions have been standardized, a function of the temperature and carbon content prior to melt-out may be employed to determine what action is appropriate to increase the oxidation rate.

In the 250-ton fixed furnaces considered in this paper an empirical relationship between carbon and temperature is used to guide the melter as to when additions of oxide should be made prior to melt-out and how large those additions should be. Premature additions of oxide are undesirable as they delay the completion of melting and upset the slag composition. On the other hand, undue delay in making oxide additions decreases the production rate as it delays the commencement of a vigorous refining boil.

Co-ordination of Heating and Oxidation during Refining

Regarding co-ordination of heating and oxidation during refining in this stage of the process the evolution of carbon monoxide from hearth level produces vigorous stirring which aids transfer of both heat and oxygen. As already emphasized, it is highly desirable that the heating and oxidation processes should have been co-ordinated so that the charge is in the correct state of oxidation at melt-out. However, if the state of oxidation as indicated by the carbon content is incorrect at any time during refining, action must be taken to accelerate one process relative to the other. If the carbon content is excessively low in relation to the temperature the charge must be recarburized. If overoxidation is not excessive it may be sufficient to take steps to reduce the rate of pick-up of oxygen, while keeping heat input at the maximum compatible with the safety of the furnace structure.

In liquid-fuel fired furnaces this may be done by reducing the steam flow. Reduction in the jet effect of the flame will slightly decrease the rate of heat-transfer, but will have an even greater effect on oxidation by the steam. The longer flame will give reducing conditions over more of the hearth area further decreasing the rate of oxidation. In gas- and oil-fired furnaces a similar effect can be achieved by decreasing the air/fuel ratio and increasing the furnace pressure. Some furnace operators advocate the use of lime additions to check the carbon loss in overoxidized charges. Increasing the CaO content of the slag decreases the iron oxide activity so that for a limited period oxygen is used to bring about transfer of further iron to the slag instead of eliminating carbon. However, as the higher iron content aids transportation of oxygen through the slag layer and the subsequent rate of carbon elimination is accelerated, this technique must be applied with care.

If the charge is underoxidized carbon elimination can be accelerated by feeding iron oxide, by increasing the steam flow or by lancing with oxygen. If fume formation must be avoided some mixture of oxygen with nitrogen, steam, or carbon dioxide may be employed. Only in exceptional conditions or if there is difficulty in eliminating sulphur to the desired level should the fuel input be reduced to avoid overheating the charge. In this connection the immersion pyrometer is an invaluable tool as with continuous knowledge of the metal temperature feeding may proceed at the optimum rate. There is today no excuse for overheating a charge and having to cool it back to the desired tapping temperature.

Acceleration of the Open-hearth Process

The main factors limiting production rate are the rate of progress of heating and oxidation, though it is important not to overlook the possibility that the production rate of an open-hearth furnace can also be restricted by either inadequate facilities for charging raw material or for dealing with the metal after it leaves the furnace, or due to extension of the refining period because of the type of steel being produced.

In discussing production rate it is essential to take into account the nature of the raw materials. As previously mentioned, the open-hearth process has exceptional flexibility for coping with different proportions of steel scrap and blast-furnace metal and it can also deal with blast-furnace metal either in the molten condition or as cold pig-iron. While various combinations of charge are possible, economic considerations result in most open-hearth furnaces being operated on one or other of the following two types of burden:—(*a*) The major proportion of the charge is scrap and the minor proportion cold pig-iron; (*b*) the major proportion of the charge is molten iron from the blast furnace or mixer and the minor proportion steel scrap.

In comparing these two variants of the open-hearth process, it is noticeable that the production rate of the hot-metal process is characteristically higher than that of the cold-metal process despite the very much greater metallurgical burden in the former. This difference in production rate is accounted for by the following three factors:—

(1) Lower total heat requirement because of the heat content of the molten iron; (2) molten iron can be charged faster than solid materials, and (3) there is more agitation during the melting period.

In the cold pig-iron/high scrap process the greater part of the oxygen requirement is met by absorption from the furnace atmosphere and it is not possible to add any substantial quantity of iron oxide with the charge. In the absence of an ore boil the semi-molten charge lies quiescent, heat transfer from the flame being restricted and substantial temperature gradients being set up within the charge. Completion of melting, and

thus the commencement of the refining boil, is delayed.

It is commonly found in cold-metal practice that during the melting period the charge is unable to accept heat as fast as it could be generated in the furnace and the fuel input must be reduced temporarily to avoid overheating the furnace structure. On the other hand, the vigorous agitation produced by the ore boil so increases heat receptivity that in the hot-metal process heat may be transferred to the charge virtually as fast as it can be generated. Thus, as far as production rate is concerned, a high proportion of hot metal is an advantage in that there is more carbon available to produce agitation. However, the accompanying silicon and phosphorus increase the thickness of the slag layer which tends to slow heat transfer.

Influence of Furnace Size

In discussing production rate some reference must be made to the influence of furnace size. It is generally accepted that output is approximately proportional to hearth area, but increasing the depth of the bath also increases production rate slightly[2]. This implies that the rate of transfer of heat and oxygen is more or less proportional to the surface area. However, the influence of bath depth emphasizes the important contribution of convective transfer. Acceleration of both the hot- and cold-metal processes can be achieved by conversion to all-basic construction, which permits an increase in the temperature differential between flame and charge. This can have a profound effect on the rate of heat transfer. If the rate of heat transfer is increased by this means or by improved agitation, it may be necessary to take steps to increase the rate at which fuel can be burned in the furnace. This may involve improving draughting or possibly the use of oxygen to accelerate combustion.

A further limit to the production rate in both the hot- and cold-metal processes is imposed where the oxidation process depends on the transfer of oxygen from the slag layer to the metal. Oxidation can be greatly accelerated by penetrating the slag layer with a jet of oxidizing gas. Reference has already been made to the effect of steam injected with liquid fuel. The use of steam alone would result in an undesirable decrease in the metal temperature. Oxygen can and is used to accelerate oxidation, but, except at low carbon content, the evolution of fume presents a most serious problem. The use of a combination of oxygen and steam might provide a solution to both of these problems and achieve a useful increase in production rate. This is not to suggest that the open-hearth furnace is necessarily the correct type of vessel for a predominantly pneumatic process, but it would permit more efficient use of existing furnaces which represent a most substantial investment.

Acceleration of the Cold-metal Process

The production rate of furnaces working with a high proportion of scrap in the charge will be limited by the greater charging time, but, as already stated, the main factor limiting output is the difficulty of transferring heat to the metal during the melting period when there is no bath action. The use of basic refractories for the furnace roof is in many instances prevented by the fact that it is not desirable to keep the furnaces operating seven days a week. In oil furnaces the high-velocity flame makes a substantial contribution to agitation of the slag and metal during the melting period and it would be worth while increasing the steam pressure and volume to the level found by experience to be the optimum. An excessive increase in the quantity of steam would not only shorten the flame and increase its temperature, so that damage to a silica roof might be anticipated, but would also increase the rate of oxidation necessitating an alteration to the burden.

Addition of Carbon

It is possible to produce bath action during the melting period by use of iron oxide either charged between the layers of scrap as in the hot-metal process or, less effectively, added to the slag during melting. The extent to which these measures can be adopted is limited by the amount of carbon available. To increase this by charging additional pig-iron would increase the metallurgical burden and give a thicker slag layer which would tend to slow down the rates of heat and oxygen transfer. Addition of carbon in a relatively pure form is more advantageous and anthracite is frequently incorporated in the charge in cold-metal practice. It should be advantageous to charge both carbon and iron oxide and thus obtain additional stirring action without increasing the slag bulk. The cost of this would have to be balanced against the gain in productivity which could be achieved. An addition of anthracite to the charge may also permit the use of more steam or the addition of ore during the melting period.

Acceleration of the Hot-metal Process

The hot-metal process employing a high proportion of iron in the charge does not exhibit the same inherent limitations to production rate as does the cold-metal process. Large furnaces operating without oxygen can achieve rates exceeding 40 ton/hr. and with the use of oxygen, production rates of 100 ton/hr. have been achieved. However, a typical production rate for a 200-ton furnace is only about 20 ton/hr. This suggests that in many instances full advantage is not taken of the various measures to increase rates of heating and oxidation.

These may be summarized as follow:—(1) Use of basic roots to permit high heat input and high furnace temperature; (2) steps to ensure that fuel can be efficiently burnt in the furnace at the required rate; (3) attention to the sequence of charging to produce good bath agitation during the melting period; (4) reduction of the slag bulk by flushing; (5) injection of large quantities of high-

pressure steam with the flame to increase agitation and accelerate oxidation: (6) acceleration of refining by controlled additions of iron oxide or preferably by lancing with oxygen or a steam/oxygen mixture.

Conclusions

To achieve a high rate of output and consistently good steel quality the open-hearth operator must control both the state of oxidation and the heat input. Co-ordination of these factors to produce correct conditions at melt out and tapping, though more difficult than in other processes, is possible if full advantage is taken of all available techniques.

The total amount of heat required does not vary significantly from charge to charge, but the oxygen requirement. which is often variable, must be known accurately. Much is known about the factors determining the rate of transfer of heat and oxygen to the charge, but the knowledge is qualitative rather than quantitative. Even if all practicable steps are taken to standardize and control all the significant factors there will still be variation in heat and oxygen transfer on account of the effect of factors which cannot be conveniently measured or controlled.

On the basis of close observation of furnace operation it is, however, possible to predict the general trend of melt-out conditions. These predictions can be checked by sampling the metal for carbon and determining the temperature as soon as the bulk of the charge is molten. Adjustment of the state of oxidation can be achieved by superimposing a controllable action on the normal process of oxidation. Such action may be taken before or after melt-out, but early action saves furnace time. The simplest corrective actions involve the addition of iron oxide or blast-furnace metal.

Better production rates are, however, achieved if the oxidation rate is altered by adjusting steam flow and the flame characteristics. Oxygen lancing or the addition of carbon in the form of graphite will be very advantageous if the practical difficulties can be overcome.

Rate of Heat Input

To increase the output rate of an open-hearth furnace the rates of oxidation and heating must be accelerated, but this must not be at the expense of co-ordination of these processes. The rate of heat input is normally the limiting factor as the state of oxidation can be controlled by adjusting the proportions of the materials charged. The use of basic roofs is very advantageous but the key to improved heat transfer is more vigorous stirring of the charge during the melting and refining periods.

Any steps which increase gas evolution within the charge are worthy of consideration and a significant improvement in stirring can be obtained by increasing the velocity of the flame.

The very high production rates that are obtainable with other steelmaking processes are most attractive, but before it is concluded, that the open-hearth process cannot be competitive it is important that it be critically studied to see what improvements may still be possible. Analysis of production records suggests that performance can be substantially better than the current average achievement. It is hoped that this paper may help to stimulate interest in the possibilities of modifying furnace construction and operation to bring performance nearer to the ultimate potential of the process.

Acknowledgment

The authors wish to thank the directors of Colvilles, Limited, for permission to publish this paper.

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US Oven and Beehive Coke Production

PRODUCTION of oven and beehive coke in the United States in 1960 increased 2 per cent. over the 1959 total, but was 19 per cent. below the average output of the years 1947-49, according to the Bureau of Mines, US Department of the Interior. Total production in 1960 was 57,228,718 short tons, of which 1,009,610 tons came from beehive ovens.

The slight increase in coke production was due to the gain in oven-coke output, as beehive production dropped 6 per cent. Production of oven coke in the first quarter was high, averaging 6,100,000 tons per month, but dropped steadily in the following quarters, falling to 5,200,000 tons in the second, 3,800,000 tons in the third, and 3,600,000 tons in the last quarter.

Beehive coke followed the production trend of oven coke with output highest in the first quarter and dropping in the succeeding quarters. The total output of beehive coke in 1960 amounted to only 2 per cent. of the total oven- and beehive-coke production and was only about one fifth of the average output of 1947-49.

Steel Production in Poland

IT is expected that Poland's output of steel this year will reach 7,100,000 tons, a figure which contrasts with the pre-war peak output of 1,440,000 tons. The output per head of the population will thus rise, from a pre-war peak of 42 kg. a year, to 241 kg. a year.

A major contribution to this achievement will be that of the "V. I. Lenin" integrated iron and steel works at Nowa Huta, where a tenth blast furnace has recently been completed and blown in, and work has been started on the construction of an agglomeration plant with an annual capacity of 8,000,000 tons of ore.

When this plant is eventually completed, it will produce about 3,500,000 tons of steel annually.

MECHANIZATION AND SAFETY IN MINES

Presidential Address to South Staffs Managers

by J. A. EVERY*

ALTHOUGH safety is always a top priority with colliery management, increased attention must be paid to it when coupling it with increased mechanization and with the concentration of output. If we are to hold our markets against the fierce competition from oil, certain principles must be adhered to; these are a stable selling price, product availability, consistent qualities, efficient service to consumers, adequate publicity, and restoration of confidence in the coal-mining industry, which suffered from adverse publicity during 1959 and 1960.

To maintain stable selling prices against increasing wages and material costs it is vital to increase efficiency at the pit. This is the battle and the challenge to all who work in the coal-mining industry and it will be fought in one place only—at the coal face. Officials at higher levels can direct, plan and guide, but the real test will be the efficiency of pits and maintenance of machinery.

The chairman of the National Coal Board has said that increased mechanization must be forthcoming to achieve increased efficiency, but some basic points must be considered if the heavy programme of mechanization is to succeed.

Increased face mechanization at any mine must bring added responsibility to the colliery manager and a concentration of face mechanization must not only increase the production, but also increase the problems of management. Problems and stresses are not strangers to colliery management, but I suggest that the biggest single stress is caused by a loss of tonnage due to breakdown of machinery.

Those with good concentration performance figures will say that if concentration is to be successful, every machine on the face must be backed up by at least two more, *i.e.*, one in the gate and one being overhauled. It would indeed be a happy mechanization officer who could say that this was possible in most cases.

As with machines, so with the men who service them. If we are to do battle, and we are told it is a battle, then we must adopt battle tactics. With mechanization, the day of the pick and shovel collier is on the way out. No one, and especially the pick and shovel man, will feel any remorse at this, and all will welcome his place being taken over by the machine and technician.

The board must pay some attention to the problem of attracting suitable face technicians if its scheme for mechanization is to operate successfully. This point cannot be emphasized too much since this is one of the major problems besetting the colliery manager who is committed to a heavy mechanization programme. Too often a feeling of resentment is found among technicians who keep machines running to maintain output, resulting in obvious monetary benefits to the face contractor; while this feeling exists there are bound to be difficulties with maintenance men, and, make no mistake, these are the men who will largely be relied upon to get maximum output from mechanized faces.

Again, in relation to concentrated outputs from faces, an enlightened outlook must be forthcoming with relation to the supervision on this type of face. Are we justified in planning a face for full mechanization in every detail, costing in the region of £100,000, and then handing it over to an overman and deputies to supervise? An output to justify this outlay must be in the region of 5,000 to 10,000 tons per week and from a production point of view this is a mine in itself and must therefore receive the weight of supervision that is justified by a small mine. The officials on the face might be the best practical men in the country, but can they be expected to cope with the complicated hydraulic and electrical switchgear which abound a modern face? In fact, on occasions, their very enthusiasm for production is sometimes the cause of a breakdown by overloading the machine when a technically trained man would have exercised a certain restraint.

The day is approaching when the deputy on this type of face will need to be removed from production altogether and devote the whole of his time to his statutory and safety obligations, leaving the production to an overman with an undermanager to co-ordinate all operations on the section.

Whatever strides are made in production, these will be neutralized if the safety standards and acci-

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dent rates are allowed to deteriorate. The responsibility of safety standards and accident rates are firmly and squarely on the manager's shoulders, so obviously if anything can be done in this problem to help the manager it will indirectly help in the efficiency and ultimately in the results of the pit.

The general method of safety control at collieries is the responsibility of the safety officer. Here again, the time is ripe to have a fresh look at this particular department with all the aspects covered by it. Usually, the points covered by the colliery safety officer include accident prevention, accident records, ventilation records, stone-dust control and records, sanitary control, promotion of accident prevention propaganda, special air samples for spontaneous combustion control points, and firefighting control, etc.

A recent study of a safety officer showed how a typical safety officer spent his time. It was noted that 25 per cent. of his effort was spent on clerical work and, during spot check for a week, only 8 per cent. on accident prevention. This clerical work consisted of entering records and making returns to area. This work could be done by a clerk whose duty it would be to enter all records and fill in the forms for statistical use. This would allow the safety officer more time to get round the pit and do the work that is most useful to the manager.

The possibility of the safety officer being removed from the managerial control should be strengthening the staff of the Area safety branch looked at. Possibly this could be achieved by with an extra official whose main function would be purely one of physical examination in the pit and reporting to the Group manager. The number of records kept by the safety branch at the pit no doubt reflects on the amount of clerical work necessary by the Area safety officer and the subsequent lowering in the number of physical examinations made by this branch. These remarks are in no way a criticism of the branch, but on the system which prevents them from doing its work, which I feel is most likely to be of benefit to the manager.

While we are looking at records, perhaps the usefulness of the information disclosed should be examined critically. One of the records kept and presented to a colliery manager is the accident rate expressed in the rate/100,000 manshifts worked. This information reflects the safety of the pit compared with other pits. It does not give a true picture of the pit by the very nature in which the information is assembled.

The information is based on the incidents which keep a man away from work for three days or more. It takes no account of the severity of each accident and the number of shifts lost by each accident. To illustrate the point, a study of two faces was made over a period of five months and is shown in Table 1.

TABLE 1.—*Comparative Study.*

	Face A.	Face B.
Accident rate per 100,000 shifts ..	1.20	2.86
Number of accidents	7	18
Shifts lost	125	138
Shifts lost per accident	17.85	7.68

It is quite possible for a pit to have a bad accident rate/100,000, manshifts but be entirely free from accidents of such a nature that they are reportable ones, which are the rates that should receive the greatest limelight.

It is true to say that the greatest impact made on a colliery manager is a figure expresed in £ s. d. or o.m.s. and in these days when a colliery manager does not have to bear the cost of the accident in compensation, the true effect of the accident rate is not felt. Whether or not it is possible to present to the manager a figure with a greater impact than that already presented I do not know, but I put out the point for consideration.

Relating accident rates to production is not palatable, but if there was no production there would be no accidents; no battle is fought without casualties, and providing that every possible precaution is taken, a clear conscience should be the right of every manager.

BOOK REVIEW

Colliery Year Book and Coal Trades Directory, 1961. Iliffe Books, Limited, Dorset House, Stamford Street, London, S.E.1. 916 pp. 45s. (by post 46s. 9d.)

FOREWORD to the 1961 edition of this valuable reference book is contributed by Lord Robens, chairman of the National Coal Board. This is the 39th year of publication and the information in the latest edition has been comprehensively revised and supplemented where necessary. Particularly to be noted is the addition of recent amendments to the Mines Regulations.

The contents of the volume are too well known and appreciated to call for reiteration here. Certainly no one engaged in the coal and allied industries can afford to be without a copy, for the wealth of practical information which it carries ensures that it is in constant use. Thorough sub-division and classification bring the answers to many queries with the minimum of delay, while the personal index is a feature that enhances the value of the work. In addition to full coverage of the British coal industry, there are many pages devoted to the industry throughout the world.

ONE OF THE FIRST reconstructed buildings in the new Northern Ireland Folk Museum Park at Cultra Manor is likely to be a water-powered spade mill from Coalisland (Co. Tyrone). The mill, with its equipment, has been presented to the museum by the directors of John Stevenson & Company, Limited. Investigation of the use and manufacture of spades has shown that within living memory over 176 different types were made and used in Ireland.

Metallurgical Patents in the US

Some Recent Inventions

DESCRIPTIONS of metallurgical patents given below have been taken from details published in the Official Gazette of the United States Patent Office.

Beambacked Planetary Rolling Mill

A planetary mill includes a transverse beam bearing an anvil member on one of its surfaces, a planetary roll chain assembly surrounding the beam, the chain assembly made up of shafts extending in the direction of the length of the beam. Casters are mounted on the shafts in spaced relationship, links interconnecting the shafts in the spaces between the casters, whereby the shafts are interconnected by the links at spaced intervals throughout the length of the shafts. Working rolls rest on and are supported by the casters on adjacent shafts.

A driven shaft, means for mounting the driven shaft, is in a position adjacent the beam, the shaft having a plurality of sprockets spaced along its length, the sprockets having recesses shaped to engage the links and teeth engaging the ends of the links, the sprockets engaging and driving directly the chain links whereby the chain assembly is driven throughout its width, and caused to traverse the surface of the anvil member under tension. A guide carries the chain from the driven shaft, around the beam and to the anvil member. —2,978,933.

Process of Desulphurizing Pig-iron

A process of desulphurizing molten pig-iron comprises holding the molten iron under reducing conditions in a closed vessel which excludes air and is provided with a vent above the surface of the molten iron and blowing from a lance whose mouth is above the surface of the molten metal on to that surface a downwardly directed stream of inert gas at a pressure in the gas before it leaves the lance of at least one atmosphere above the pressure in the vessel and treating the molten iron with a desulphurizing agent until at least 20 cu. ft. of inert gas at standard conditions of temperature and pressure per ton of pig-iron has been discharged by the lance downward into the molten iron and thence passes upward through and over the molten iron, and outward through the vent.—2,979,393.

Method for Preparing High-grade Rimmed Steel with Wide Ferritic Peripheral Zone

A method for the production of high-grade rimmed steel having a wide ferritic peripheral layer and a correspondingly narrow central zone, consisting of saturating the melt with nascent hydrogen prior to casting and then allowing the hydrogen to boil off during the solidification stage.—2,979,394.

Method of Preparing Preliminary Metal or Steel Pig-iron Containing Phosphorus

A method for producing preliminary metal and steel from a pig-iron melt having an arbitrary phosphorus content by refining the melt with oxygen-containing agents with the simultaneous addition of slag-forming substances in a refining vessel, in which a refining gas is blown on to the layer of the slag in such a manner that, during an initial stage of the refining process, the gas will not penetrate the slag layer and reach the surface of the melt and contact the latter, thereby continuously oxidizing the FeO contained in the slag to Fe_2O_3, which causes dephosphorization at the interface between the slag and the melt, the FeO thereby formed being reoxidized to Fe_2O_3 by the oxygen of the refining gas.

An improvement comprises stopping the blowing with refining gas at a stage wherein dephosphorization of the melt is completed and the melt has a carbon content higher than that finally required and wherein the carbon content can be adjusted to the final carbon content required by a subsequent heat-treating step; maintaining the temperature of the melt to permit further boil and adjusting the carbon content to that finally required during the further boil.—2,979,395.

Devices for Non-destructive Utrasonic Testing of Material

A device for non-destructive ultrasonic testing of material comprises means for emitting ultrasonic oscillations against the material under test with a carrier frequency producing ultrasonic waves in the material having a wave-length of the same order as the dimensions of the crystals of the material and for receiving the ultrasonic oscillations reflected from the material along with clutter due to reflections of the ultrasonic waves by the crystals in the material. Operating means provide for intermittently energizing the source of the ultrasonic oscillations and for receiving the reflected ultrasonic oscillations and clutter so that the oscillations are emitted for a short pulse of an order having a maximum value of one micro-second. Means generate control pulses which key the operating means. A cathode ray tube has a screen and first and second pairs of deflection plates. Time-base generating means controlled by the control pulses are connected to the first pair of deflection plates, while means actuated by the reflected oscillations and clutter transmit corresponding electrical pulses to the second pair of deflection plates of the cathode ray tube so that an oscillogram is produced on the screen which is characteristic of the reflected oscillations with the clutter due to reflections of the waves by the crystals in the material. A photocell is positioned to be responsive to the light energy from a selected section of the oscillogram corresponding to a zone of the material under test so that the output of the photocell is characteristic of the clutter in the zone.—2,984,098.

Adjustable Air Register for Oil or Gas Burners

In combination with a furnace having a combustion chamber and a throat through the wall of the furnace, means form an entrance opening to the throat, a forced air draught burner housing having a discharge opening positioned coaxially adjacent the entrance opening to and through which a forced draught of air having an axial component of movement through the

housing is supplied via the housing into the entrance opening.

Means provide for adjustably controlling the flow of air comprise an annular baffle plate defining a central opening. A support mounts the plate inside the housing in spaced coaxial alignment relative to the entrance opening and in a plane generally normal to the axis of the housing. The outer diameter of the baffle plate is substantially smaller than the interior diameter of the housing and larger than the diameter of the entrance opening to provide an air passage between the outer periphery of the baffle plate and the interior of the housing and extending between the baffle plate and the face of the wall and through which passage a portion of the forced air draught is adapted to normally flow. The central opening through the plate is of smaller diameter than the diameter of the entrance opening; and means, including the support means, provide for adjustably canting the plate to move any one side of the plate relatively closer to the wall than an opposite side whereby the size of the air passage between the plate and the face of the wall may be varied from one side relative to the other.—2,984,296.

Tape Method for Detecting Fatigue Cracks

A method for detecting fatigue cracks in a metallic specimen comprises the steps of applying a transparent pressure-sensitive adhesive film to the specimen, applying a fluctuating stress to the specimen until bubble formation is manifested in the area covered by the film and observing the area covered by the film for bubble formation.—2,984,101.

Control of Fuel Burners

A furnace having a burner wall provided with a throat opening and having a burner disposed to fire through the throat opening, a throat tile ring disposed in the opening, the ring having therein a radial passage extending at right angles to the axis of the burner and adapted to receive light ravs emitted by the flame from the burner. Means provide for defining a dark target spot disposed on the tile ring diametrically opposite and in alignment with the radial passage, a sighting tube extending parallel to the axis of the burner and having its rearward end disposed in the wall and in communication with the radial passage. A reflector is disposed at the intersection of the sighting tube and the radial passage to reflect light rays from the burner flame axially along the sighting tube and a light sensitive device carried by the tube in registration with the path of the light rays for sensing the presence of a flame in the burner throat.—2,984,297.

Cooling of Moving Strip

A method of cooling continuously moving strip comprises passing the strip through an enclosed zone while passing a fluid coolant, in a direction generally parallel to the direction of movement of the strip, through each of a plurality of conduits disposed within the enclosed zone in a bank which extends laterally there-across, and individually controlling the rate of coolant flow through each conduit.—2,983,497.

Heat-treating Method and Apparatus

An annealing furnace for the treatment of the chromium-nickel and straight chromium grades of stainless steel, comprises an elongated furnace shell of labyrinthal and tortuous configuration along its length, and having a work entrance portal end and a work exit portal end, the shell being divided along its length into separate heat-treating zones with means for heating the zones to the required temperature. Means sealed to the exterior provide for separately pushing the work to be annealed through each zone. At least one further compartment is disposed laterally of the furnace shell and connected into the labyrinthal path at a point intermediate the length of the shell, provides a high-temperature holding chamber for receiving work product requiring prolonged heat-treatment; and means sealed to the exterior for pushing the work into the further compartment for treatment and pushing the same out of the compartment and back into the labyrinthal path after treatment for discharge at the exit portal of the furnace shell.—2,984,474.

Production of High-purity, Ductile Titanium

A process for producing a titanium powder suitable for use in powder metallurgy comprising free impact milling in an inert atmosphere at temperatures below 100 deg. C. a substantially anhydrous mixture of an alkalinous metal halide and titanium metal obtained from the reduction of titanium halides, the mixture being free of elemental alkalinous metal and having at least 20 per cent. by weight of alkalinous metal halide, the milling being conducted until the milled metal particles are in a size range wherein substantially all pass a 14-mesh screen.—2,984,560.

Stainless Steel and Method

A fully austenitic heat-hardenable stainless steel of good hot-working characteristics and consisting essentially of about 12 to 18 per cent. chromium; 15 to 30 per cent. nickel; 3.00 to 6.50 per cent. silicon; 1 to 4.50 per cent. molybdenum; with the sum of the molybdenum and silicon contents at least about 5.5 per cent.; carbon not exceeding 0.15 per cent.; copper up to 3 per cent.; tungsten up to 3 per cent.; columbium up to 1 per cent.; nitrogen up to 0.20 per cent., and remainder substantially all iron.—2,984,563.

Method of Making Pig-iron and Producing Malleable Iron

A method of making white iron in the manufacture of malleable iron which comprises melting a charge including scrap and pig-iron containing about 1.25 to 17 per cent. by weight of silicon to produce white iron, at least a portion of the pig-iron also containing a minor amount not less than 0.0012 per cent. by weight of boron and sufficient boron to provide from about 0.00024 to 0.005 per cent. by weight of boron in the white iron.—2,984,564.

Method and Apparatus for Annealing Coils of Metal Strip

In a method of heating coils of metal strip, the steps include placing a coil with its axis vertical on a bearing surface, placing on the coil a pair of bearing plates spaced apart, one overlying the other, placing a second coil on the upper of the last-mentioned plates, enclosing the resulting stack, discharging and igniting a combustible mixture of gases around the space between the pair of plates and exhausting burned gases from the space thereby heating the coils principally by conduction through the plates directly into the edges of the coil plies in contact therewith.—2,983,502.

Method and Apparatus for Heating Ingots

A method of heating ingots in a soaking pit having heat recovery means comprising charging ingots into a chamber having a flue adjacent the bottom thereof, introducing hot air into the bottom of the chamber through the flue, introducing fuel into the flue, and after the ingots have reached a predetermined temperature discharging a high calorific fuel into the chamber near the top and regulating the flow as required.—2,983,499.

Henry Brutcher Translations

NEW translations in the field of ferrous metallurgy issued in June by Henry Brutcher are listed below. A complete list (including non-ferrous papers) and individual papers may be obtained from Henry Brutcher, Technical Translations, P.O. Box 157, Altadena, Calif., USA.

5179: "Natural Gas in the Reduction Reactions of Iron Ores in a Fluidized Bed." K. P. LAVROVSKII, A. L. ROZENTAL', and A. KH. EGLIT. Izvest. Akad. Nauk SSSR, OTN, Met. Topl., 1961, No. 2, pp. 13-19; 3 figs. $9.75.

5104: "Combustion of Carbon During the Sintering of Iron Ores." A. A. SIGOV and V. A. SHURKHAL. Izvest. Vuz- Chern. Met., Dec., 1960, No. 12, 23-30; 4 figs., 3,600 words. $8.85.

5181: "Some Peculiarities of the Reduction of Hardened Pellets from Southern Concentrates by Gases." G. V. GUBIN, *et al.* Izvest. Akad. Nauk. SSSR, OTN, Met. Topl., 1961, 1, 147-9; 3 figs., 750 words. $2.85.

5054: "Production of Sinters of Increased Basicity and Smelting Them in the Blast Furnace." L. VON BOGDANDY. Stahl und Eisen, v. 81, 1961, No. 1, 12-22; 16 figs., 6,900 words. $17.70.

5157: "Study of Reducibility of Sinter." J. WILLEMS and G. QUADE. Stahl und Eisen, v. 81. 1961, No. 9, 552-8; 14 figs., 4,600 words. $11.25.

5164: "Electrolytes for the Polishing and Etching of Austenitic Cr-Ni and Mn Steels." G. BASSI. Metalloberfläche, v. 52, 1961, No. 2, 141-2; 500 words. $2.25.

5002: "Effect of Alloying Elements on the Tempering of Steel." A. S. ZAV'YALOV and M. I. SENCHENKO. Metalloved. Term. Obrab. Met., Dec., 1959, No. 12, 2-11; 6 figs. $2.50.

5003: "Structure of the Hardened Layer Produced in Grinding." V. A. LANDA. Metalloved. Term. Obrab. Met., Dec., 1959, No. 12, 12-18; 7 figs. $3.00.

5004: "On a Hypothesis About Phase Changes in 'Krauz-Tarnavskii Bands'." M. V. RASTEGAEV. Metalloved. Term. Obrab. Met., Dec., 1959, No. 12, 19-23; 3 figs. $2.50.

5005: "Effect of Creep at Elevated Temperatures on the Internal Friction and Elastic Modulus of Metals." I. A. ODING, *et al.* Metalloved. Term. Obrab. Met., Dec., 1959, No. 12, 24-31; 5 figs. $2.50.

5006: "Fatigue Strength of Hot-rolled Steel Rods and Fats with Scaled Surface." I. V. KUDRYAVTSEV, *et al.* Metalloved. Term. Obrab. Met., Dec., 1959, No. 12, 31-35; 3 figs., 4 tables. $2.50.

5007: "Improving the Corrosion Fatigue Strength of Pump Rods (by Surface Hardening)." R. M. RASKIN and R. A. BAGRAMOV. Metalloved. Term. Obrab., Met., Dec., 1959, No. 12, 35-38; 4 figs. $2.50.

5008: "Structure and Hardness of Surface-hardened Spheroidal-graphite Cast Iron." M. M. KLIMOCHKIN. Metalloved. Term. Obrab. Met., Dec., 1959, No. 12, 39-43; 4 figs. $2.00.

5013: "Speed of Sound Propagation as a Quality Criterion of Gray Cast Iron." ANONYMOUS. Metalloved. Term. Obrab. Met., Dec., 1959, No. 12, 55-60; 7 figs. $3.75.

5009: "Distribution of Manganese and Nickel Between the Phases in White Cast Iron." I. E. LEV. Metalloved. Term. Obrab. Met., Dec., 1959, No. 12, 44-7; 2 figs. $2.00.

5010: "Structural Changes in Ferritic Magnesium-treated Cast Iron." A. I. YATSENKO. Metalloved. Term. Obrab. Met., Dec., 1959, No. 12, 47-50; 4 figs. $2.00.

5011: "Spray Coating of Gray Iron Castings with Aluminium." F. L. AL'TER-PESOTSKII. Metalloved. Term. Obrab. Met., Dec., 1959, No. 12, 51-2; 3 figs. $2.00.

5012: "Oxidation of Steel and Cast Iron at High Temperatures." E. M. BLANK. Metalloved. Term. Obrab. Met., Dec., 1959, No. 12, 53-4; 3 figs. $2.00.

5037: "Investigation of the Reduction Kinetics of Ferrous Oxide by Solid Carbon at Temperatures Above 1,400 deg. C." V. V. KONDAKOV, D. I. RYZHONKOV, and D. M. GOLENKO. Izvest. Vuz-Chern. Met., April, 1960, No. 4, 23-8; 6 figs. 2,700 words. $6.65.

4931: "Heat Extraction in the Secondary Cooling Zone During Continuous Casting of Steel." A. D. AKIMENKO and A. A. SKVORTSOV. Izvest. Vuz-Chern. Met., July, 1960, No. 7, 54-9; 3 figs., 2,300 words. $6.90.

5067: "Desulphurization of Pig-iron and Steel in Vacuum." G. N. OIKS, *et al.* Izvest. Vuz- Chern. Met., Sept., 1960, No. 9, 18-28; 9 figs., 3,900 words. $9.75.

5167: "Production of Steel Ingots Whose Pipe Welds up in Subsequent Hot Working." G. N. OIKS and F. A. SOKOLOV. Izvest. Vuz- Chern. Met., March, 1961, No. 3, 37-39; 1,300 words. $3.80.

5045: "Absorption and Elimination of Gases in the Top Pouring of Heavy Forging Ingots." E. SCHÜRMANN, M. HATER, and A. FRICKE. Stahl und Eisen, v. 81, 1961, No. 3, 172-83; 11 figs., 9,200 words. $18.40.

5121: "Increasing the Output of an Experimental Blast Furnace by Incorporating Oxygen and Carbon Monoxide into Blast." K. SPOLDERS and W. WENZEL. Stahl und Eisen, v. 81, 1961, No. 3, 149-54; 8 figs., 3,500 words. $8.85.

5189: "Rapid Method for Determination of Aluminium in Steel Without Separation of the Iron." H.-H. DOLESCHEL. Stahl und Eisen, v. 81, 1961, No. 7, 448-9; 1 fig., 1,500 words. $3.50.

5139: "Diffusion of Hydrogen in Semi-finished Steel." S. YA. POVOLOTSKII. Izvest. Vuz- Chern. Met., Oct., 1960, No. 10, 79-83; 2 figs., 1,900 words. $5.70.

5153: "Wear Resistance of Iron and Steel Improved by Electrolytic Sulphurizing." S. S. CHERNYAK, *et al.* Izvest. Sibir. OTD. Akad. Nauk SSSR, 1961, No. 1, 25-30; 5 figs., 2,000 words. $5.90.

5180: "Investigation of Heat-resisting Steel As-cast and As-forged." B. M. KOLOBASHKIN. Liteinoe Proizvodstvo, 1960, No. 12, 34-36; 1,500 words. $4.20.

5025: "Dimensions of the High-voidage Zones in the Blast-furnace Stock Column." V. K. GRUZINOV. Izvest. Vuz- Chern. Met., Aug., 1958, No. 8, 3-6; 1 fig., 1,500 words. $4.30.

5086: "Determination of Humidity of Blast-furnace Wind." A. M. CHERNYSHEV, *et al.* Trudy Inst. im. A. A. Baikova, v. IV, 1960, pp. 53-7; 3 figs., 1,300 words. $3.40.

5081: "Oxidation of the Impurities Present in Steelmaking Baths." Communication 1. V. I. YAVOISKII and A. F. VISHKAREV. Izvest. Vuz- Chern. Met., May, 1960, No. 5, 39-48; 3 figs., 4,100 words. $9.75.

5137: "Electroslag Remelting of Roller-bearing Steel for Improved Quality." Part 2. I. PETRMAN and I. KASIK. Hutnické Listy, v. 15, 1960, No. 11, 842-51; 10 figs., 7,000 words. $17.50.

5129: "Determination of Columbium in (Pig- and Cast) Irons." A. I. PONOMAREV and A. YA. SHESKOL'SKAYA. Trudy Inst. Met. im. A. A. Baikova, v. IV, 1960, pp. 240-2; 1,500 words. $4.25.

4934: "Method of Testing Nitrided Cases on Steel for Brittleness." N. A. FERTIG. Zavodskaya Laboratoriya, v. 21, 1955, No. 1, 200-201; 1 fig., 800 words. $2.70.

5130: "Effect of Segregation of Elements in Cast Technical Iron on Plasticity." G. N. MEKHED. Trudy Inst. Met. im. A. A. Baikova, v. IV, 1960, pp. 254-6; 1,000 words. $2.80.

5192: "Surface Defects on Rolled Steel." P. YA. RYZHKOV and R. M. SHERESHEVSKAYA. Metallurg. May, 1961, No. 5, 25-26; 1 fig., 500 words. $2.25.

Divisional Structure for the IEE

MUCH of the scientific work of the Institution of Electrical Engineers has been for many years conducted by four specialized sections (electronics and communications, measurement and control, and supply and utilization). The council has decided that it will be advantageous for the four sections to be replaced by three divisions, two of which will represent electronics and power interests, while the third, a general division, will cover activities of common interest to all electrical engineers, such as basic measurement, and technological education.

Each of the divisions will comprise a number of technical groups designed to cover the specializations within its field, and the scheme provides for speedy readjustment and creation of these groups which will increase the flexibility which is now more than ever necessary to reflect the rapid developments of electrical science and engineering.

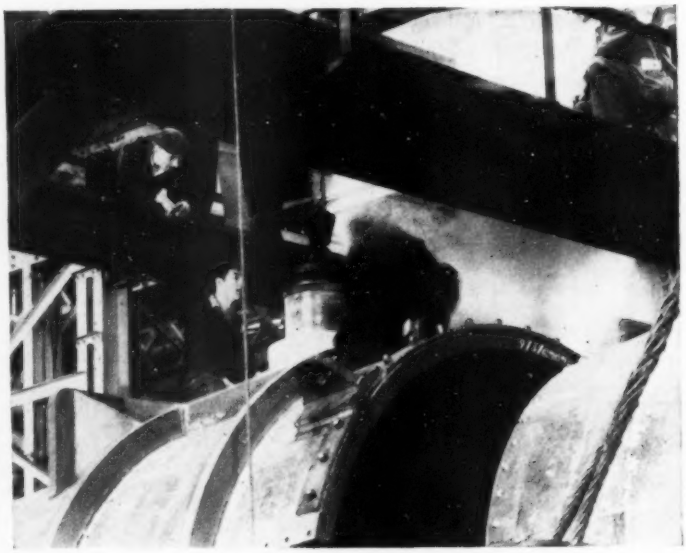
In setting up a divisional structure the council also recognizes the increasing importance of electronics in electrical engineering, and the part being played by electronics engineers in the work of the institution.

2-FT. DIA. TRUNNION PINS NITROGEN SHRUNK

EIGHT steel trunnion pins each over 2 ft. across were nitrogen shrunk to fit four 100-ton ladles recently at the Teesdale Ironworks of Head, Wrightson & Company, Limited. To fit the ladle bores, the diameter of the pins was shrunk by an average of 0.4 in.

A light, insulated tank 2 ft. deep was made to hold the liquid nitrogen supplied by the British Oxygen Company, Limited. The tank could be moved on rails above the ladles which were set up on bogies. By means of a 2-ton electric hoist, each pin was lined up with the ladle bore and then raised while the liquid nitrogen tank was positioned underneath. The pin was lowered into the tank and immersed in liquid nitrogen pumped direct from a BOC road tanker.

On average, each pin was immersed for about 52 min. A total of 1,232 gal. of liquid nitrogen was used.



THE SHRUNKEN PIN BEING LOWERED INTO THE LADLE BORE.

Nitrogen shrinking was the most economical and only practical way of fitting the trunnions. Heating the ladle bore would have been much more difficult and costly and taken a great deal longer. In addition, the metal might have been distorted and weakened.

A BRUSSEL'S REPORT states that Ets. J.-J. Carnaud et Forges de Basse-Indre increased its tinplate production from 170,000 tons in 1959 to 196,000 tons in 1960, following the installation of the electrolytic tinning line at Basse-Indre. By the end of this year tinplate capacity is to be raised to 240,000 tons per annum.

New Literature

SOME of the house magazines, catalogues, booklets, and other publications received are referred to below. Readers wishing to obtain a copy of any of the items should write to the address given, at the same time mentioning this journal.

DAVID BROWN TRACTORS, LIMITED, Meltham, Huddersfield—The company exhibits at many agricultural and industrial equipment shows at home and abroad, and the August edition of David Brown Tractor News contains photographs and other details of stands at shows held recently.

HEAD, WRIGHTSON & COMPANY, LIMITED, Teesdale Iron Works, Thornaby-on-Tees (Yorks)—Wright Ahead is the title of the company's monthly newsletter, the July issue of which is to hand. The 12 pages are filled with news of the various companies in the group, presented in a bright and readable manner.

INCANDESCENT HEAT COMPANY, LIMITED, Cornwall Road, Smethwick, Birmingham—The company's sheet steel division has published as reprint No. 512 an article on "Open-coil Annealing," by V. J. Gibbons, general manager of Lee Wilson Engineering, S.A., Fribourg, Switzerland, which was published in the May issue of our sister journal *Sheet Metal Industries*.

ELECTRICAL RESEARCH ASSOCIATION, Cleeve Road, Leatherhead (Surrey)—"The Origin and History of E.R.A. Research on Steels for High Temperatures" is the subject of an article by Dr. N. P. Allen, FRS, in the July number of Co-operative Electrical Research (2s. 6d., postage 6d.). Other contributions include "Equipment of the New E.R.A. Creep of Steel Laboratory," by J. W. Dalton.

HALL & PICKLES, LIMITED, Port Street, Manchester—This 150-year-old firm is continually expanding and developing its Hydra Steel Works at Sheffield. The most modern plant for the production of tool steels, cutting tools, stainless and heat-resisting steels, and special-purpose wire has been installed. An attractive booklet has been issued (publication No. 10) to detail briefly the products of the works.

W. C. HOLMES & COMPANY, LIMITED, Turnbridge, Huddersfield—The Trion electronic air filter, marketed by the company for industrial applications since 1956, has been redesigned to meet the arduous operating conditions encountered in industry. It is now known as the Industrion electrical air filter, which is the subject of an article in the summer issue of the Turnbridge News, which also contains notes on other items of the company's equipment, together with news of employees and their activities.

BRITISH TIMKEN, Duston (Northants)—Contribution made by the employees of the Timken Roller Bearing Company in helping to make British racing cars among the best in the world is oulined in "All the Winners Ride on Timken Bearings," an article in the July number of Timken. Silverstone, most famous motor-racing circuit in the British Isles, is almost on the doorstep of the Duston and Daventry factories of the British Timken Division. Many other interesting features are included in the issue.

TIN RESEARCH INSTITUTE, Fraser Road, Perivale, Greenford (Middx)—The latest issue (No. 52) of Tin and Its Uses contains an article by R. H. W. Burkett on the properties and manufacture of tin oxide resistors for electronic purposes. The oxide is formed in thick layers on ceramic bodies by decomposition of a volatile tin compound. Advantages claimed are freedom from catastrophic failure, good moisture resistance, resistance to mechanical damage, ability to operate at a high temperature, and a low temperature co-efficient. The suggestion is made in this issue that "metal whiskers" are not likely to grow upon surfaces electroplated with tin-nickel alloy. Trials to establish this point have been in progress for two years at the institute.

ARMSTRONG WHITWORTH (METAL INDUSTRIES), LIMITED, Close Works, Gateshead-on-Tyne—Close-up, published quarterly, always achieves a happy balance between technical articles and features of wider appeal. The June issue, just received, includes an article on "Vanwersch Articulated Roof Bars," in which D. J. Todd relates how Armstrong Whitworh (Metal Industries) became actively interested in the invention of two Dutch brothers. J. Hetherington writes on "Quality Control in the Steelfoundry." R. Johnson on "The Buckton Borer," while there is a brief survey of the activities of Raine & Company, Limited, the Tyneside re-rollers. On the lighter side, A. Lane tells the story of an unconventional holiday which he took almost 30 years ago.

ASSOCIATED ELECTRICAL INDUSTRIES, LIMITED, 33, Grosvenor Place, London, S.W.1—Dr. N. F. Eaton, of the research department of Associated Electrical Industries (Manchester), Limited, and D. B. Gasson and F. O. Jones, of the AEI research laboratory, Aldermaston, are the authors of "Applications of Electron Bombardment Heating in Metallurgy," which is published in the July/August number of AEI Engineering. Electron bombardment heating has found many applications in research and industry. The technique permits intense and controlled heating over small areas without contamination of the material being heated. The application of this form of heating to such processes as zone melting, single crystal preparation, welding, and ingot production is described. Articles on "High-breaking-capacity Cartridge Fuses" and "Nuclear Power Reactor Control" are among other features of the issue.

BRITISH MINING EQUIPMENT AT ZAGREB AUTUMN FAIR

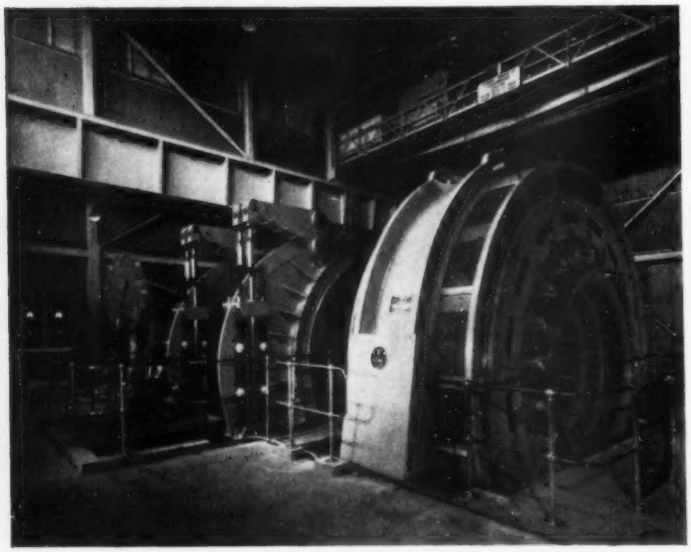
THE British Mining Equipment Export Association will have a stand in the Board of Trade Pavilion at the Zagreb International Autumn Fair, and the following members of the association will be exhibiting their products:—Bonser Engineering, Limited; British Insulated Callender's Cables, Limited; Clayton Equipment Company, Limited; Cable Belt, Limited; Distington Engineering Company, Limited; Joy-Sullivan, Limited; Mining Engineering Company, Limited; Oldham & Son, Limited; A. Reyrolle & Company, Limited; Wickman, Limited.

This is the first occasion on which a group stand of mining equipment manufacturers has been organized at an international trade fair; it is an example of one kind of collective effort which the British Mining Equipment Export Association is fostering.

Friction Winder

AT HEM HEATH COLLIERY

COMMISSIONED in August, 1960, the four-rope friction winder at Hem Heath Colliery, in No. 1 (North Staffs) Area West Midlands Divisional Coal Board, has a single four-deck cage, raising a 12-ton coal load from 3,190 ft., one of the deepest hauls in the country. The winder was supplied by Associated Electrical Industries, Limited. The 14-ft. dia. friction drum was sub-contracted to Vickers-Armstrongs (Engineers), Limited, and the brakes were provided by Blacks Mining Equipment, Limited.



FOUR-ROPE FRICTION WINDER IN OPERATION AT HEM HEATH COLLIERY, AREA NO. 1, WEST MIDLANDS DIVISIONAL COAL BOARD. THIS WINDER, DRIVEN BY A 3,300-H.P., 60.1 R.P.M., D.C. MOTOR, IS ONE OF SIX SIMILAR WINDERS BEING SUPPLIED TO THIS AREA.

The winder, the first of six similar machines being supplied to this Area to be handed over for commercial service, is driven by an overhung d.c. motor, the drum shaft being extended to mate with the motor half of the coupling. The armature is located by a small spigot and secured by a number of semi-fitted bolts which are accurately tensioned hydraulically during installation. This arrangement ensures that the driving torque is transmitted by friction between the mating coupling surfaces. The motor bedplate is extended longitudinally and it is possible to jack the machine frame along in order to inspect armature windings, etc., without dismantling.

Rated at 3,300 h.p. at 60.1 r.p.m., the winder is supplied from an induction motor-driven m.g. set, motor rating 3,000 h.p., generator rating 2,400 kW., speed 496 r.p.m.

The winder tower is a composite steel and concrete structure with upper portion aluminium-clad. The tower was erected over an existing air lock which has been embodied in the winder tower. The winder, control desk and auxiliary gear such as cam gear, black controller, etc., are located on the top floor. The deflector sheaves, m.g. set. exciter set, two associated starters brake pumps, and control cubicle are located on the floor below.

Electrical features of special interest are:—

(1) Use of plastic-covered copper busbars for the main d.c. loop.

(2) The amplidyne closed loop speed control requiring a minimum of control components. It is essentially a low impedance input system with isolated inputs which avoid difficulties such as parasitic pickup and drift often associated with high input impedance system.

(3) Provision of automatic starting of the m.g. set and auxiliary machines from the driver's desk. This arrangement ensures that the driver can easily shut down and restart the m.g. set without leaving his chair. The driver can reduce the idle running of the m.g. set to a minimum with no personal inconvenience.

(4) A new type of cam gear is used by means of which the driver can select the winder destination before commencing a wind. The mineshaft serves seven levels and the driver selects the appropriate level by means of a switch on the desk. Regardless of the operation of the switch, however, the cam gear will always come into operation at the end of the wind and it is equally effective for working between levels.

1961 Edition of "Metal Statistics"

Now in its 54th edition, "Metal Statistics," published by the American Metal Market, presents in a compact volume useful current and historical data. The 1961 edition of this recognized standard reference book for all interested in any way in metals is now available. The "little red book" is packed with more than 400 pages of statistics covering all of the important metals from aluminium and beryllium to vanadium and zinc. The volume also contains an index and a valuable 130-page buyers' and sellers' guide. A number of new tables have been added this year. Copies may be obtained from the American Metal Market, 18, Cliff Street, New York 38, NY ($3.75 post free).

The Coal Industry Today

DISCUSSION ON MR. E. H. BROWNE'S CONFERENCE PAPER

Mr. L. R. Milligan, who presided at the session of the annual conference of the National Association of Colliery Managers, held in Edinburgh in June, at which the paper by Mr. E. H. Browne, deputy chairman, National Coal Board, was presented and discussed, said it was useful to look into the future of the mining industry from time to time. He recalled that at the association's 1951 conference Mr. Browne had looked ahead towards 1965, and what he had said in his address then had proved to be not far away from the facts. The paper was published in our issue of June 30, p. 1401.

MR. T. SMITH said that Mr. Browne had given the meeting a brilliant statistical analysis of the present economic position of the mining industry.

It was interesting to note from his analysis that the total accumulated deficit in the 14 years of nationalization was approximately equal to the loss incurred in importing American coal during that period. Bearing this in mind, it was most disappointing to find certain interests which, having enjoyed the benefits of subsidized imported coal during the past 14 years, were prepared to forget that fact when the NCB had an adequate amount of coal for sale at a slightly higher cost, temporarily, than that of imported American coal.

Coking Coal for Steelmaking

MR. BROWNE said that there were a number of factors which, in his view, made the request by the Steel Company of Wales for an import licence unjustifiable. Not the least of these was the fact that the National Coal Board had maintained unprofitable capacity and had invested capital to replace it so as to furnish the coking coal called for by the steel companies in Wales. The board had, moreover, brought in American coal at the very severe loss indicated in his paper during the period of shortage, because the board had been regarded as responsible for furnishing in one way or another the coal requirements of industry in this country. If there was a need to import coal it seemed clear to him that it was for the board to import it. Today there was no need to import coking coal into South Wales. He thought that the application by the company was unfortunate.

MR. C. N. RATCLIFFE (Yorkshire) commented on what he described as somewhat conflicting points concerning individual achievements in increasing productivity, and the statement that places where production plans could be adjusted to suit the available manpower were not, in general, the places where increased production would be helpful. In regard to money and markets, also, there seemed to be a conflict with productivity. They could increase productivity by mechanization, but that could have a tendency to lower selling price. He asked which had the greater importance for the Coal Board, efficiency and productivity, or a higher selling price.

MR. BROWNE said that he must indeed have expressed himself badly if anyone had the impression that individual achievements were unimportant; it was on such achievements that the whole success of the industry depended. There were two points which he had tried to make. First, that every individual colliery could not be expected to pay and that comparisons between individual collieries must take into account factors beyond the control of management—for instance, the allotment of house-coal markets, near to hand or far afield, which affected the proceeds considerably. The second point was that financial criteria were all-important and that productivity by itself was not always an accurate measure of local performance.

If it was impossible for every pit to be profitable all the time, it seemed reasonable to aim towards making each coalfield stand on its feet financially. This would not always be possible everywhere; but it was something to be aimed at.

He agreed that sometimes the pressures on management seemed to be conflicting, but it was the task of management to seek the right balance. The industry must meet the demand for large and graded coals, because they were wanted at the present time, whereas there were stocks of smalls. Productivity must be at the highest level because it was a major factor in costs; where there was a shortage of manpower there was an extra need for high productivity. But the financial results provided the most comprehensive guide. Selling price was only one element; costs were all important. It was a case of striking the best balance to obtain the best results for the board in every situation.

SIR ANDREW BRYAN felt privileged to express the thanks of the meeting to Mr. Browne for his address, and said the association was honoured by it. He had given to the conference a remarkable opening address, providing a comprehensive survey of the industry's problems and a very clear picture of the industry in the past, the present, and the future.

Appointments

New Chief Engineer for Cochran & Company

FOR the past two years the firm's technical sales manager, Mr. HUGH M. SIMPSON has been appointed chief engineer of Cochran & Company, Annan, Limited, boilermakers and engineers, of Annan, Scotland. Mr. Simpson received his technical education at the Royal Technical College, Glasgow. He joined the company in 1924 and after a period in the drawing office went to the London office on the technical sales side. He returned to Annan in 1934 as an assistant to the technical manager.

In 1943 he was appointed assistant technical manager and in 1949 assistant technical sales manager. During the time that Mr. Simpson has been with Cochran's he has played a prominent part in the development of economic boilers and waste heat recovery problems.

Mr. COLIN NORTON-SMITH has been appointed public relations officer for the Locomotive and Allied Manufacturers' Association, Locomotive House, London, S.W.1.

Appointed general manager (overseas operations) of the General Electric Company, Limited, Mr. E. J. AARONSON was previously economic and financial adviser (export).

Formerly headquarters staff manager of the National Coal Board, Mr. F. P. COOK has been appointed group personnel manager with Venesta, Limited, makers of aluminium foil, plywood containers, etc., of London, E.C.4.

Manager of Waterhouses Colliery (Co. Durham), for the last two years, Mr. J. C. HUGHES has been transferred to Handon Hold Colliery, Beamish. He was formerly undermanager at Langley Park Colliery and Rising Sun Colliery.

Mr. ALEXANDER MORRISON, divisional purchasing and stores controller for the North-Eastern Divisional Coal Board, has been appointed chief officer of supplies to London County Council in succession to Mr. T. G. Jones, who will retire in October.

Mr. D. R. WALKER has been appointed secretary of the Vitreous Enamel Development Council, whose registered offices have been moved from 11, Ironmonger Lane, London, E.C.2, to 28, Welbeck Street, London, W.1 (telephone: HUNter 2237). The general manager of the Council is Cmndr. G. Clarke.

Mr. R. O. REILLY, assistant works manager at the Doncaster (Yorks), works of the International Harvester Company of Gt. Britain, Limited, has been appointed works manager of the company's factory at Idle, Bradford (Yorks). He is succeeded by Mr. W. E. ATKINSON, general superintendent (tractors), at Doncaster. Mr. J. T. MILES, general superintendent (implements), succeeds Mr. Atkinson and Mr. J. E. SANDIFORTH, general superintendent at the Idle works, takes over from Mr. Milnes.

Mr. CONWAY THOMAS, an assistant to the divisional accountant at the tinplate division of the Steel Company of Wales, Limited, has been appointed assistant divisional accountant. He joined the Richard Thomas Company, Limited, in 1933 and was transferred to the Swansea sub-section in 1946. The following year he became development clerk for the tinplate division and was closely associated with all major development schemes. Mr. W. E. ("BILL") BENNETT has taken over the post of cost accountant for the division.

Levelling Potteries' Spoil Heaps

GIVING details of improvements being carried out in the Fenton coal-mining area of Stoke-on-Trent, Sir Keith Joseph, Parliamentary Secretary to the Ministry of Housing and Local Government has stated in a letter to Mr. Ellis Smith, MP for Stoke-on-Trent South, that 1,000 tons of spoil are being removed by the NCB each week from Fenton tips. The work has been going on for two and a half years so that one large mound has disappeared and another is expected to be levelled within nine months.

Sir Keith states that the spoil is being stowed underground. When the second Fenton tip has gone, the board will begin work on the next oldest tip. Spoil heaps at Longton, especially those at Parkhill and Mossfield, contain quantities of red shale and he is to draw the Ministry of Transport's attention to the possibility of using this material in major road works in the Potteries.

Higher Exports of Coal from Welsh Ports

EXPORTS of coal, coke and patent fuel from the South Wales ports to July 16 this year were 140,628 tons heavier than in the corresponding period last year at 1,530,323 tons.)Foreign shipments went up from 644,122 tons to 767,954 tons, and coastwise from 745,573 tons to 762,369 tons. Iron and steel exports, at 327,407 tons, showed an increase of 112,991 tons, but there was a fall in tinplate exports of 43,573 tons to 240,505 tons.

Imports of iron ore during the period fell by 284,095 tons to 2,446,108 tons, while iron and steel imports also dropped by 53,564 tons to 143,806 tons. Pitwood and mining timber imports were down by 12,235 tons to 63,896 tons.

Total imports and exports at the various ports to July 16 this year (with the figure for the corresponding period in 1960 in parentheses) were:—Newport, 1,322,166 (1,261,098) tons; Cardiff, 1,283,816 (1,239,364) tons; Barry, 730,812 (694,423) tons; Port Talbot, 1,784,839 (2,018,038) tons; Swansea, 3,324,311 (4,434,760) tons; Penarth, 171,644 (211,159) tons; Lydney, 13,908 (15,512) tons.

Common Market Alternative?

QUESTIONING how long the present buoyancy in Western Europe will last, the August issue of the China Trade and Economic Newsletter suggests that some people foresee a time when India, for example, will be a rapidly expanding market while Western Europe is stationary. There is an economic basis, the Newsletter adds, for a trade partnership of China and the Soviet Block with Britain and the Commonwealth.

Suggesting China as more immediately relevant to such a forward-looking assessment, the Newsletter points out that between 1949 and 1959 that country expanded its industrial production by 1,100 per cent., its agricultural production by 150 per cent. and its foreign trade by 300 per cent. and there is no doubt that after the pause necessitated by the heavy crop losses due to recent natural disasters, its expansion will be resumed.

French Steel Market

INCREASED HOME AND EXPORT ORDERS

(From Our Special Correspondent)

NEW orders received by the French steel industry in the past few weeks have been above the level of previous months, and also of the corresponding period last year. On the home market, demand for structurals, beams and other heavy products used by steel fabricators is strong and can be expected to go on rising, as activity in this sector is increasing rapidly. Activity in building and contracting is also satisfactory, although stocks built up in these sectors have affected the demand for concrete reinforcing bars.

Demand for sheet remains level, while orders from car manufacturers show a seasonal improvement. The request from the durable consumer goods industries has weakened in the last weeks, although increasing demand for sheet is noted from metallic drum and barrel making works. Manufacturers of agricultural machinery have also increased their orders, as well as the drawing and section shaping industries. The wire drawing and cold rolling sectors, however, have shown some slackness.

Orders registered by French mills in the ECSC market remain at a high level, about 37 per cent. above the level at this time last year, while a further increase in orders from other export markets has been achieved. Prices in these latter markets are still regarded as far from satisfactory, although an improvement in prices of sheet is expected soon.

Indications from the French steel-using industries show that, in many cases, forecasts made at the beginning of the year as to activity and level of steel consumption are being revised upwards.

Iron Ore and Steel Project in Dominican Republic

UNDER an agreement between the Dominican Republic Government and the Chicago firm of Meissner Engineers Inc. for the establishment of a major mining and metal producing enterprise, 51 per cent. of the assets will be owned by the Dominican State. Investment in capital equipment will be about $60,000,000. The exploitation of large iron-ore deposits in the provinces of Sanchez Raminez and Duarte is estimated to produce annually 5,000,000 tons of iron ore when shipments start in 18 months' time and this amount may be doubled in three years.

The Dominican Republic will receive about $25,000,000 annually from these developments and the figure is likely to increase. Plans are also being made to establish an iron and steel industry, which will produce steel sheet and constructional materials. The Dominican Republic is one of the richest areas in the world for minerals including manganese, nickel, cobalt, chrome, molybdenum, zinc, and bauxite.

N. GREENING & SONS, LIMITED—Mr. N. MacGregor has been appointed to the board.

Walter Somers' Heavier Volume of Work

CHAIRMAN of Walter Somers, Limited, forgings and die block manufacturers, of Halesowen (Staffs), Mr. F. J. Somers states that a greater amount of work on hand exists in all departments than at this time last year. With the new plant the group now has, he looks forward to a more satisfactory year in 1961-62, but points out that costs still continue to rise, and this has been aggravated by the recent Budget.

He says that acting on Government encouragement, it was decided some years ago to convert the reheating furnaces from solid fuel to oil firing. This conversion had been completed "and it seems most unfortunate that a tax should now have been placed on fuel oil which will cost us £17,000 in a full year." The full effect of the Budget, he adds, is estimated to cost the company an extra £24,000 this year and a further sum if the payroll tax is introduced.

Despite the necessity to raise an overdraft during the year—the year end figure was £223,591—the excess of current assets over liabilities was little below that of last year, most of the money raised having been used to finance additional steel stocks and work-in-progress necessitated by the greater variety of work being undertaken.

Increased Profits by Hepworth Iron

WITH group profits expanded to £520,501 (£385,782), the Hepworth Iron Company, Limited, manufacturers of drain pipes and clayware underground cable conduits, etc., of Hazlehead, near Sheffield, is raising its dividend for the year ended March 31, 1961, to 7½ (6 equivalent) per cent. and proposes a one-for-three scrip issue. Net profit increased to £289,001 (£218,782) after tax of £231,500 (£167,000).

The directors state that the proposed increase in the issued capital reflects the reinvestment of profits for fixed assets and does not imply that the amount of profit distributed for the current year will also be increased, as regard will be made to the economic circumstances ruling at the time.

BRITISH OXYGEN COMPANY, LIMITED—Mr. L. S. Kinnear has resigned from the board.

The Scrap Markets

Trade Suffers Dual Depression

COMBINATION of holidays and the persistent decline in demand for iron and steel is resulting in the scrap merchants having a thin time at the present. With the closing of five steel furnaces and the taking of one blast furnace out of commission, it follows that orders for steelmaking scrap have suffered a further decline.

Foundry holidays have resulted in a drop in the intake of cast-iron scrap. Firms operating in the wider sphere of second-hand steel suitable for re-rolling abroad are exporting sizable tonnages to Hongkong and Far Eastern customers.

Cleveland—The double effect of the fall in the demand for iron and steel and the holiday season is making the scrap trade very quiet and patchy. Limited orders for steelmaking scrap have experienced a further relapse and a resumption of allocations, even on a limited basis would be welcome. The consumption of short heavy steel scrap by some foundries is being well maintained and this trade is expected to improve in the next week or two.

Specifications for medium and heavy grades of cast-iron scrap are fairly consistent, but supplies available are rather restricted. Most scrapyards are marking time preparing for a future revival which it is hoped will mean a better all-round demand and also a much larger intake of turnings and destructor scrap by the blast furnaces.

Scotland—The iron and steel scrap market throughout Glasgow and the west of Scotland more or less closed down due to the annual holidays of both producers and consumers of scrap.

The steelworks have reopened for deliveries, but merchants will be put on a limited allocation and some difficulties will be experienced in disposing of their present arisings.

UK GROUP'S PART IN PERU POWER SCHEME

PRELIMINARY agreement has been reached by a British and West German consortium with the Peruvian Government to begin installation of the first stage of Peru's Mantaro River hydro-electric project. The consortium consists of the English Electric Company, Limited, and George Wimpey & Company, Limited, of the UK, Siemens Schuckerts, of West Germany, and private banking interests in both countries. The project will have an eventual capacity of 3,500,000 kW.

Work is also expected to start this year on expansion of the Chimbote steel plant. Its current production of 60,000 tons of steel ingots a year will be increased to 500,000 tons as markets warrant. The work will be undertaken by another West European consortium.

MANCHESTER office of David Brown Corporation (Sales), Limited, will be located in future at Ashburton Road, Trafford Park, Manchester 17 (telephone: Trafford Park 4751/2). The move is coincident with the transfer of the company's machine tool division to these premises from Britannia Works, Sherborne Street, Manchester. The office handles sales of all products of the David Brown gear and foundry groups.

Swedish Ore and Steel Profits

WITH business conditions firm in the West European iron and steel industry during 1960, demand for ore exceeded the 1959 level by a considerable margin, but supplies were adequate and prices remained largely unchanged, states the board of Trafikaktiebolaget Grängesberg-Oxelösund, the Stockholm iron ore and steel group.

During the year the production of ore from the company's mines totalled 2,240,000 metric tons, of which Grängesberg contributed 1,870,000 tons, chiefly lump ores and fines, while the newly-opened Strassa Mine yielded 370,000 tons of concentrates. Deliveries amounted to 2,170,000 tons against 1,620,000 tons in 1959. Of total ore deliveries, 1,720,000 tons were exported. The gross profit of the ore business for 1960 was Kr. 47,200,000 (Kr. 35,300,000).

Parallel with the continuation of large-scale investment at the Oxelösund Iron and Steel Works, certain production units were put into operation during the year, the board states. From the previously existing plants, output of pig-iron rose to 143,000 tons, and that of sponge iron to 33,000 tons.

Demand for steel products of Uddeholms Aktiebolag, Uddeholm, Sweden, was good throughout 1960, states the board, and sales of those products which tied in with the company's long-term sales and production policy rose considerably. Owing to a tendency towards products of higher value it was possible to raise turnover by about 13 per cent., though no significant price increases were introduced for quality steel.

The company's output of steel ingots rose from 310,300 tons to 338,834 tons, and that of finished steel from 208,722 tons to 213,689 tons. Output of iron ore fell from 89,150 tons to 84,623 tons. At the Hagfors steelworks the major increase in production was in tool steel, stainless steel bars, and castings. The company's works at Vällingby also increased its output of hard metal, particularly UDDIA standard tools, special tools and UDDEX cutters. At Storfors, the output of drawn and stainless tubes rose slightly.

Total sales of Uddeholm group iron and steel products in 1960 amounted to Kr. 319,100,000 against Kr. 282,600,000 in 1959.

Kelvin & Hughes Expansion

UNDER a regrouping scheme, the Hillington, Glasgow, factory of Kelvin & Hughes, Limited, a subsidiary of S. Smith & Sons (England), Limited, is to undergo expansion and from August 6 the factory will become part of the industrial division of the parent firm. Previously it was responsible for the production of industrial instruments and marine and aviation equipment.

Mr. W. T. Slater, deputy chairman of Smith's industrial division, will be responsible for the expansion of the existing research facilities at the Hillington factory, which will include a new laboratory. He was assistant managing director of Kelvin & Hughes.

ENGINEERING EQUIPMENT worth £2,370 has been given on permanent loan by the Newall Engineering Company, Limited, manufacturers of machine tools and measuring instruments, of Peterborough (Northants), to Peterborough Joint Education Board to be used in the new technical college at Peterborough.

IRON AND STEEL TRADE

DEMAND for iron and steel has reached its lowest point for many months and even with the works holidays now at their height, there are scant signs of any improvement likely to put the plants now closed or on short time back into full production. Only in isolated cases will rolling mills primarily concerned with heavy sections have to catch up with a slight backlog of accumulated orders. It would seem that the large stocks held by the big steel users are a major factor in limiting new orders. The demand for structural steel and plate has slowed down considerably over the past few weeks and unless there is a substantial change for the better it is inevitable that more plants will be obliged either to close down or ease off, resulting in more dismissals and short-time working.

Pig-iron

Stocks of pig-iron are more than sufficient to cope with any demand that may arise with the resumption of work at the foundries. The present easy position ensures prompt delivery for consumers.

Most makers have capacity to spare and would welcome additional orders and more and more interest is being placed on securing oversea orders.

Semi-finished Steel

Re-rollers of light materials are not using anything like the quantity of billets and other semi-finished steel sufficient to engage the present capacity of the industry. Holidays are affecting production and an improvement in business is looked for at the end of the month when the holiday period is over.

An appreciable tonnage of reinforcing rods and bars continues to be taken up, but the total is below the normal level, and the trade in small bars, light sections, strip, and bright drawn bars is very slack. Works producing the alloy steels are the most heavily committed for their outputs.

Finished Steel

For some weeks now business has been very quiet from the structural yards and the shipyards and, here again, makers are looking forward to the position improving in the early autumn. The present demand certainly does not cover outputs which have been on a reduced scale for some months.

This position applies not only to joists and sections but for heavy plate mills also, and the makers of sheet are also feeling the pinch of reduced trade in many directions. All round, additional business would be more than welcome.

NEW LOADING PIER FOR LIBERIAN ORE

CONSTRUCTION started last week of an ore-loading pier at the Free Port of Monrovia in Liberia to handle the country's growing exports of iron-ore. The pier will be used by the Liberia Mining Company which mines extensive deposits in the Bomi Hills 43 miles inland. The company shipped its first ton of iron ore in 1951 and is at present still the only producer in the country. The Republic Steel Corporation has a substantial stock ownership in the company.

Another ore pier, now under construction for the National Iron Ore Company, Limited, is expected to be completed in August when the company's Mano River ore deposits are expected to come into production.

Ore Chartering

THE time charter section has been fairly active and, in the main, owners are hoping that recent improvements in rates can not only be maintained but possibly still further improved. Further tonnage has been taken up from Marmagoa to Japan, 9,500 tons to Yawata-Chiba Range for August 25/September 11 at 48s. f.i.o.t. with 800/1,500 tons and about similar size for September/October to same discharging Range at 43s. f.i.o.t. but with 3,000 tons load. Inquiry is maintained.

There is also some demand for Continental discharge. North Africa reports La Goulette/Poland at 21s. 6d. f.i.o. for 10,000-tonner early loading, but little is apparently being fixed from the area to the Continent. West African ore chartering is also quiet but, nevertheless, there is some inquiry for the Continent.

Bauxite has been fixed from Eleusis Bay/Rotterdam or Emden at 22s. 9d. for about 8,300 tons prompt and there are inquiries for September from Toulon/South Wales and also from Takoradi to East Coast UK. Despite the fact that there is no particular pressure from the Mediterranean district, tonnage does not offer too freely.

Rather more interest is noted from Casablanca to this side with 2,400 tons recently fixed to Ellesmere at 37s. 6d. Casablanca/Rieme reports 4,700 tons for middle August at 25s. and Saffi/Antwerp about 15,000-tonner for second half August at 19s. 9d.

Talks on Joint Planning Board for Industry

EMPLOYERS organizations and the Trades Union Congress have been invited by Mr. Selwyn Lloyd, Chancellor of the Exchequer, to consider with him the setting up of a joint body to study the country's economic prospects. It is considered that the Government has in view the creation of a new planning board which would discuss such matters as productivity, exports, and wages.

Mr. Lloyd, in his invitation, points out that the first meeting would be to discuss what form the joint examination should take. It is understood that in fact he intends to have two preliminary meetings—one with employers' organizations and the other with the TUC, the suggested date being August 23. Besides the TUC, the organizations invited are the Federation of British Industries, the British Employers' Confederation, the National Union of Manufacturers, and the Association of British Chambers of Commerce.

Coalfield News

Curate to Work at the Coal Face

BELIEVING it to be the only way to tackle his new job as Britain's first "Pit Parson," the Rev. Leslie Brooks, a Church of England curate, who has been appointed industrial missioner to Markham Main Colliery, near Doncaster (Yorks), is planning to spend part of his time working at the coal face. "I feel that the church is not geared to meet the needs of the miner," he said. "That is my job. If I am asked to advise on political or industrial issues, I will try to do so without taking sides."

National Union of Mineworkers' delegate at the pit, Mr. "Jock" Kane, said: "We will welcome Mr. Brooks here and will give him every help, but if he works as a miner he must join the union and pay his 2s. weekly subscription."

HAVING DECIDED to close the Sunniside Drift at Roddymoor and Wooley Colliery, Crook, the Durham Divisional Coal Board has offered the 80 displaced miners work at Brancepeth Colliery, four miles away.

NOW OPERATING off the River Tyne, the NCB's sea boring tower is to be moved a mile further north later this month. The tower is at present proving coal reserves which will be worked from Westoe Colliery, South Shields.

AFTER 51 years' service in pits in Co. Durham, Mr. James Turnbull has retired. Born in New Herrington in 1896 he started work on the screens when he was 13 before going underground to work at datal jobs. He has worked at Sherburn Hill, Ryhope, and Thornley collieries.

WITH AN OUTPUT of 75 cwt. per manshift, miners at Bogside Mine, Alloa, recently set up what is claimed to be a record for any drift mine in the UK. Overall average for Scotland is 24 cwt. and the UK average is 28½ cwt. Bogside Mine started production late in 1959 and employs 290 men.

FOR THE PAST 21 years head medical room attendant at Allerton Bywater Colliery, Castleford (Yorks), Mr. J. S. Barker has retired. Formerly a member of the committee of the Castleford division of the Yorkshire Collieries Ambulance League, he has spent nearly 50 years in first-aid work.

COMPETING in the National Coal Board sports at Mansfield on Monday, Arthur Rowe broke the European shot putt record for the second time during the holiday weekend with a throw of 64 ft. 2 in. His new distance beat his own European best and set new figures for the Empire, UK, and AAA national records.

OVERALL productivity in the Durham Division of the NCB during the first 30 weeks of the year averaged 23.13 cwt. per manshift against 22.08 cwt. in the corresponding period of 1960. At the face, productivity reached 65.95 (64.66) cwt. Last week overall productivity was 22.71 (21.84) cwt. per manshift, with 65.21 (64.51) cwt. at the face.

AFTER DISPUTES last week at Nine Mile Point Colliery, Cwmfelinfach (Mon), the 700 men employed there resumed normal working on Wednesday. On August 2 about 120 workers were sent home after a stoppage over men employed clearing up the coal face the previous night, and the men decided to stop work until after the Bank Holiday.

A COLLIERY PUMPSMAN, Mr. Hugh M. Thomas (60), one of only two men underground at Tower No. 1 Colliery, Hirwaun, South Wales, died of carbon monoxide poisoning when a compressor malfunctioned and sent fumes along pipes into the pumphouse where the man was working, an Aberdare inquest was told. A verdict of Accidental Death was returned.

BUILDING of a slurry-burning generating station at Methil, Fife, is proposed by the South of Scotland Electricity Board, which hopes to commission the station by 1965. Mr. A. A. Wallace, secretary of the generating board, said the station would use about 250,000 tons of slurry a year from the Fife coalfield, which had previously been left in deposits or tipped into the sea.

HEANOR (Derbyshire) man, Mr. John King, whose invention of a safety device has saved many lives in collieries, has been posthumously honoured in his home town. His invention consisted basically of a rope attached to the pit cage which was capable of holding it if the winding mechanism failed. Derbyshire Miners' Association has presented an enlarged photograph of the inventor to Heanor Urban Council to be hung in the council offices.

Former Miner's £200 Claim

DECISION of the National Coal Board not to allow a former Yorkshire miner, Mr. Arthur Moss, the £200 redundancy payment he would have received if he had not gone sick for five days after 52 years' work at the same pit was upheld by Lord Robens, NCB chairman, on Wednesday, after making a personal review of the claim. Mr. Moss (66), of Barnsley, started work as a lamp boy at Houghton Main Colliery in 1908. To qualify for his redundancy pay he had to complete 10 days work after his 64th birthday, but because of an old injury his doctor ordered him home at the end of five days.

Lord Robens emphasized that with any agreement of this type a man must fulfil certain conditions in order to qualify. "Wherever the dividing line between qualification is drawn, cases of this kind can arise. Even if there are good reasons for changing the line there would still be people who failed to qualify by a narrow margin."

Commenting on the result, Mr. G. Wilkinson, secretary of the Houghton Main branch of the National Union of Mineworkers, said: "If the NCB does not back down, I'm sure the men will strike, they are very angry." The case would probably be taken to court, he said.

Coal Featured at the Royal Lancashire Show

EXHIBITING for the first time at the Royal Lancashire Show, held this year at Blackpool, the North-Western Divisional Coal Board made a weighty contribution. One of the features of its stand was four pieces of coal with a total weight of three quarters of a ton.

The coal, Group 2 Domestic, was mined from the Lower Florida Seam at Golborne Colliery in the West Lancashire Area and was cut by a mechanized coal plough. The stand also included a home heating pavilion, the division's mobile central heating exhibition unit, and a 30-ft.-long greenhouse to demonstrate the use of automatic and underfeed stokers.

THE COAL TRADE

BEYOND a few orders for small quantities for immediate delivery, merchants are marking time until the flow of house coal from the collieries is resumed. A fair demand appears to be building up for delivery before the end of the summer price period and business should be fairly good in the coming weeks. Colliery ground stocks are much less than a year ago, but in contrast, merchants are more satisfactorily placed and the only likely cause of any shortage to the public would be through transport difficulties occasioned by bad weather.

LEICESTERSHIRE

There is little change in the house coal position. Tonnages have dwindled during the past few days, and this is due to distributors having been compelled to cancel temporarily, tonnages which might arrive and which could not be cleared before the summer recess. This applied mostly to the middle grades of coal and the lower groups have been accepted at most depots.

The same position applying in other areas has probably been responsible for a sudden increase in advices for anthracites. These, however, are mostly of Groups B and C and although distributors are accepting them presumably against orders placed previously, they are all likely to be put to stock for delivery to consumers later on when these qualities may be more acceptable. Stove nuts particularly have shown an increase in advices.

There is no improvement in the supply of smokeless fuels. Cleanglow continues to be available but recently supplies moved have been negligible and it is not thought likely that there will be any great tonnage movement until later in the season. Coke for central heating is now completely out of season and there is no tonnage worth noting being moved.

The industrial coal market remains exceptionally firm and there is every indication that this position will be maintained. Ample supplies are available from local units and all dry cleaned and washed grades are in good supply.

YORKSHIRE

There is little change in the domestic market as approximately 35 pits in the area are on holiday, and, also, many of the larger towns are also on holiday. In spite of the colliery holidays it is reported that house coal supplies are coming through quite steadily and merchants are having little difficulty in satisfying customers' requirements. There is still a demand for trebles and doubles, however, which are not forthcoming in the required quantities. Consumers are not getting much stock down as yet, but it is hoped that with an improvement in the supply position after the holidays, a stocking programme will commence.

Customers using anthracite for cooking and central heating are becoming worried about the forward position, being aware that merchants have not been able to put any of this type of fuel into stock.

Industry is still reasonably busy in the north-eastern area, and it has been very difficult for merchants to find alternative coals during the colliery holidays, the two qualities most difficult to obtain being washed singles and washed smalls. This illuminates the difficulties likely to arise this winter with the supply of these two qualities. Merchants are advised to put down as much stock as possible after the holidays, and to ensure that various factories take advantage of any surplus which may become available during the next month or two.

Coal Consumption Exceeds Output

NOTHING much in the way of output of saleable coal can be expected while the holiday season persists and at 2,581,600 tons last week, the total was about two thirds of normal and some 400,000 tons under the requirements for the home market and exports. Productivity, however, shows no signs of falling off and is well above last year's figures.

Undistributed stocks continue to dwindle and are now down to 22,800,000 tons. Consumers, however, are managing to keep the level of their stocks up to 15,876,000 tons, nearly 2,000,000 tons more than last year.

There were 565,700 wage-earners on colliery books on July 29, against 594,290 on July 30, 1960, the numbers engaged at the coal face being 212,350 and 226,870 respectively. Total absenteeism (all workers) in the week ended July 29 was 15.37 per cent., compared with 15.47 per cent. in the week ended July 30, 1960. Output at the face was 4.292 tons and overall 1.430 tons in the week ended July 29, compared with 4.055 and 1.320 tons in the week ended July 30, 1960.

The following table gives (in tons) the provisional figures of output of saleable mined coal by division in the week ended August 5, and the tonnage lost through disputes:—

Division.	Week ended August 5, 1961.		Week ended July 30, 1960*.
	Total output.	Tonnage lost.	Total output.
Scottish	292,000	31,000	100,000
Northern (N&C)	153,000	82,000	151,000
Durham	354,000	108,000	348,000
North-Eastern	574,000	261,000	484,000
North-Western	123,000	114,000	147,000
East Midlands	627,000	256,000	552,000
West Midlands	86,000	177,000	86,000
South-Western	194,000	152,000	213,000
South-Eastern	—	28,000	—
Great Britain—			
Deep-mined coal	2,403,000	1,209,000	2,081,000
Open-cast coal	140,000	—	128,000
Other deep-mined (including licensed mines)	39,000	—	29,000
TOTAL	2,582,000	1,209,000	2,238,000

* Comparable week last year.

IN VIEW OF the new Mexican tax law, the American Smelting & Refining Company has been holding "conversations" with interested Mexican investors regarding buying into the company's holdings in Mexico.

Obituary

MR. SAM MACDONALD

THE death has occurred of Mr. Sam MacDonald, who retired last month as head of the training branch, industrial relations department, Scottish Divisional Coal Board, after 51 years in the mining industry. Mr. Macdonald began work at the age of 14 with William Finnie & Company, Limited, coalmasters, of Kilmarnock, and in order to become a colliery manager studied for 10 years at evening classes and Kilmarnock Technical College.

He passed his colliery manager's examination at 25, and a month later was appointed undermanager with J. & R. Howie, Limited, colliery owners, firebrick and fireclay manufacturers, of Hurlford (Ayrshire). In 1922 he was promoted manager of a group of collieries in the Crosshouse/Springside Area and held the position for the next 22 years.

Shortly after his resignation in 1944 to become manager of the Balgray Bauxite Company, Limited, Kilmarnock, Mr. MacDonald was injured in an accident, and the enforced inactivity led him to enrol as a student at Nuneaton Staff College where he later became a lecturer until the college closed in 1949. Later that year he was appointed assistant education and training officer at the headquarters of the Scottish Divisional Coal Board, and in 1958 became head of the department.

MR. W. F. HIGGS

PROMINENT Birmingham industrialist and former member of Parliament, Mr. WALTER FRANK HIGGS, chairman of Higgs Motors, Limited, electric motor and generator manufacturers, died on Tuesday at the age of 75. Together with his brother, Mr. D. C. Y. Higgs, he founded the Birmingham firm in 1912 and built it up from very small beginnings with a staff of seven into one of the largest of its kind in the industrial Midlands. Educated at Birmingham Technical School, he gained his early experience of the electrical motor industry with the General Electric Company, Limited, British Thomson-Houston Company, Limited, and Electric Construction Company, Limited.

A former president of Birmingham Chamber of Commerce and a life governor of Birmingham University, he began his political life on Birmingham City Council in 1934 and entered Parliament as Unionist member for West Birmingham in 1937, holding the seat until 1945.

MR. J. T. GOODWIN

FORMER general manager of the engineering department of the Sheepbridge Coal & Iron Company, Limited, Mr. J. T. Goodwin died recently at his Kent home. He was 84. Mr. Goodwin served his engineering apprenticeship with the Butterley Company, Limited, Derby, and was engaged on munitions work with the Sheepbridge Company during the 1914-18 war. He was made MBE in 1918.

Mr. Goodwin became a member of the Institute of British Foundrymen in 1905 and was elected president in 1927. He was a founder-member of the British Cast Iron Research Association.

Mr. JOHN BILTON, production manager in the Redfyre sales section of Newton Chambers & Company, Limited, Thorncliffe, near Sheffield, died at the works on Tuesday at the age of 52.

Mr. WILLIAM CAMPBELL ALLAN, a director of several North-east companies, died on Tuesday aged 75. During his career he was a director of, among others, the North Eastern Marine Engineering Company, Limited, Wallsend-on-Tyne.

Director of Naylor, Benzon & Company, Limited, iron, steel, metal, and ore merchants, of London, E.C.3, Mr. OSMUND BREWER has died. Last year he retired after 40 years as manager of the Newcastle office of the United Steel Companies, Limited.

The death occurred recently in a motor accident of Mr. GEORGE H. JACKSON, chairman of Chaseside Engineering Company, Limited, until 1958, when he relinquished his connection with the company on its amalgamation with British Northrop, Limited, Blackburn. Mr. Jackson was the originator in Europe of the mobile loading shovel, producing his first Chaseside loader in 1925.

Inquest into Cortonwood Colliery Fatality

VERDICT of Accidental Death was returned at a Wath inquest last Friday on four miners who died as a result of methane gas poisoning at Cortonwood Colliery (Yorks) recently. It was stated that 10 attempts were made inside two hours by Mr. Joe Gibbons (35), a colliery deputy, and Mr. John Pattison (65), an overman, to save the four men.

In evidence Mr. Pattison said that the ventilation on the face had been extremely good with 16,000 cu. ft. of air per minute passing along it. The outbreak of gas had been so strong however that it had forced its way 250 yds. out of the intake, against the current of air.

The colliery manager, Mr. Edwin H. Lunness (34), said the gas had issued from breaks in the floor near the main gate. "At a minimum, 750,000 cu. ft. of gas was emitted within two hours of the breaks appearing," he said.

The Sheffield assistant deputy coroner, Dr. H. H. Pilling, summing up, said: "How the gas got into the workings I feel we shall have to leave as an open question. There was no act of omission on the part of anyone which could be classed as criminal negligence."

First Visiting Professor in Industrial Administration

LEAD in business education has been taken by Manchester University which has appointed a Visiting Professor in Industrial Administration. He is Mr. Ronald Dew, at present assistant managing director of Production-Engineering, Limited, industrial and management consultants.

Referring to the university's decision, Prof. Dew said that it was an opportunity to distil all that was best in British management in general—and Lancashire management especially—and to bring to bear on industry by close co-operation, the significant contribution the university had to make.

NEWS IN BRIEF

PLANS TO SPEND $12,000,000 on facilities for producing lightweight tinplate at its Aliquippa works are announced by the Jones & Laughlin Steel Corporation, Pittsburg, PA.

FEATURING THE USE of cranes and excavators, a 29-minute film, "Smiths Make News," made for Thomas Smith & Sons (Rodley), Limited, Leeds, a subsidiary of Thos. W. Ward, Limited, was shown to an audience of Sheffield industrialists last week.

LATEST EMPLOYEES of the Appleby-Frodingham Steel Company, branch of the United Steel Companies, Limited, to go to India to help in the working of the new iron and steel concern at Durgapur are Mr. C. Clarke and Mr. R. W. Wood, both of the ore preparation plant.

MANUFACTURE OF Massey-Ferguson tractors in Brazil, as approved under the plans of Geimar, the Brazilian Government Agency, will begin shortly. This operation is being undertaken by Massey-Ferguson do Brazil, in association with the local firm of Vemag, SA, distributors of M-F products since 1946.

WHILE THE WATFORD (Herts) works of Scammell Lorries, Limited, are closed for the annual holiday (August 5 to August 21 inclusive), no goods will be despatched or received, but spares and service facilities are available at the Scammell depots in Willesden (London), Birmingham, and Manchester.

ACCIDENT FREQUENCY RATE for Richard Thomas & Baldwins, Limited (excluding Irthlingborough and Partridge, Jones & John Paton, Limited), rose from the record low rate of 0.67 in May to 1.01 in June, the highest rate since September last year and the first rate over 1.00 to be recorded this year.

ANGRY AT THE presumed death of seven men in a mining accident at Merlebach, Lorraine, 600 miners last week demonstrated outside the pit management building. The men, who have been on strike since the accident, demanded greater security measures, more pay, and the resignation of the mine's manager.

NEARLY 90 FT. LONG, 8 ft. in diameter and weighing 150 tons, a boiler drum, built at the Glasgow works of Babcock & Wilcox, Limited, for the new steelworks of Richard Thomas & Baldwins, Limited, at Llanwern (Mon), left Clydebank on Monday on its specially-planned 370-mile rail journey, which took three days.

AGREEMENT has been concluded with a company in India by Broadbent & Company (Rochdale), Limited, to supply technical data, machines, tools, and materials for springs and textile accessories used mainly in weaving. Agreements are pending for the supply of technical aid to companies in India for the manufacture of other lines.

AS WELL AS its engineering interests, the Butterley Company, Limited, Derby, has for many years farmed in Derbyshire and Nottinghamshire. The company is now to sell four of these farm properties and the proceeds of the sales are to be used for the expansion of the engineering side of the business. The company will retain about 700 acres of farmland.

WEST GERMAN IMPORTS OF British goods totalled DM 793,800,000 (about £70,900,000 at the present rate of exchange) in the period January-May this year, representing a 10 per cent. increase over the similar period in 1960. In May alone, the UK accounted for 6 per cent. of total German imports. This was achieved in the face of Common Market discrimination.

FURNASCOTE refractory coatings, formerly manufactured and marketed by Corrosion, Limited, Southampton, will in future be made and marketed by Furnascote, Limited, working from 16/18, Malvern Road, Southampton (telephone: Southampton 71347). As from September 1, all inquiries and correspondence should be sent to the sales director, Mr. G. L. Barron.

PROPOSALS FOR improving the education and training of business managers are contained in a memorandum submitted by the British Institute of Management to the Committee of Higher Education. The BIM urges the encouragement of research, the establishment of an advisory centre for industry, and the fostering of educational facilities in under-developed countries.

DRAFT amendment regulations which will enable the recorded delivery postal service to be used as an alternative to registered post in connection with the issue of certificates for contracting-out of the graduated pension scheme are to be considered by the National Insurance Advisory Committee which will consider representations on the draft regulations received by September 5.

STEEL OUTPUT of the Société Métallurgique de Normandie in 1960 rose by 15.2 per cent. over 1959, the target of 600,000 tons being exceeded by nearly 9,000 tons. A new investment programme was launched in 1960 to expand capacity by 20 per cent. in the next three years.

IN CONNECTION with the £1,000,000 contract which Leyland Motors, Limited, gained from Yugoslavia earlier this year, six senior engineers, of Gradsko Saobracajno Preduzece, Belgrade's municipal transport authority, are to visit the firm's Preston (Lancs) factories to inspect the first of the 160 vehicles called for under the contract and will undertake a four-week special engineering course in maintenance.

OPENING ADDRESS at the 1961 conference of the Purchasing Officers' Association at Brighton from September 28-30 will be given by Mr. Edward Heath, Lord Privy Seal, who will talk on "The Common Market." The problem of "Late Deliveries" will be dealt with by Dr. E. N. Hague, purchasing manager, Shell Petroleum Company, Limited, and Mr. Norman Fraser, chairman, British Chemical Plant Manufacturers' Association. Mr. T. L. Garner, managing director of Precision Rubbers, Limited, Bagworth, Leicester, has been invited to give this year's Swinbank Lecture.

ICI Employees Share £8,555,000 Bonus

UNDER the company's profit-sharing scheme, more than 92,000 employees of Imperial Chemical Industries, Limited, will share a bonus in respect of 1960 which totals £8,555,000, a record figure for ICI, and well over three times the gross sum of £2,652,857 distributed for 1954, the first distribution under the scheme.

After deduction of personal income tax, the total bonus is £6,344,000, an average of £68 17s. 6d. per employee. The previous year the average per employee was £59 4s. 10. The net bonus has been paid to the trustees of the scheme who will use it to acquire on behalf of employees £1,883,000 ICI ordinary stock to be issued by the company. Last year, £1,824,586 stock was subscribed by the trustees.

Company News

New Capital for Edgar Allen Reorganization Plans

REORGANIZATION of Edgar Allen & Company, Limited, the Sheffield steel and engineering group, with the object of expanding business and earning capacity would call for further capital investment in plant and equipment, as well as additional working capital, said Mr. W. H. Higginbotham, chairman at the annual meeting. The directors were considering a scrip issue and raising new money. For this purpose authorized capital should be increased, and it was hoped to submit proposals to members before the end of the present financial year.

Included with the chairman's statement is a review showing the shift in emphasis of demand and proportionate profitability of the various sectors of the group over the past four years. Profits from steel and steel-making have increased from 35 to 60 per cent. of the group total; those from steel castings have fallen from 30 to 26 per cent.; and engineering and track-work show a drop from 35 to 12 per cent.

In the engineering department there was no contract work of any importance during the year, but Mr. Higginbotham reports a much greater current volume of inquiry, particularly for cement making plant and equipment.

JOHN BROWN LAND BOILERS, LIMITED—All the share capital of P.H.I. Engineering, Limited, coal and raw material pulverizers, of London, S.W.1, has been acquired by the company, a wholly-owned subsidiary of John Brown & Company, Limited.

BORAX (HOLDINGS), LIMITED—The directors have declared an interim dividend in respect of the year to September 30, 1961, of 4 per cent. on the deferred ordinary stock subject to deduction of income tax. The dividend will be payable on September 13.

BRITISH STEEL PILING COMPANY (HOLDINGS), LIMITED—With a final of 11½ (10) per cent. dividend for 1960 is being raised to 13½ (12½) per cent. Group net profit, including for 1960 the profit of the Egyptian subsidiary, increased to £59,707 (£27,540) after tax of £35,974 (£27,727).

WOLVERHAMPTON METAL COMPANY, LIMITED—"We, in company with other industries, cannot foresee the effect on us of the possible participation in the Common Market, but we are studying its implications very carefully," states the chairman, Mr. J. H. Furnival. The order-book is satisfactory and the plant fully employed.

ARNOTT & HARRISON, LIMITED, manufacturers of engineers' tools, of London, N.W.10—The company announces that shareholders accepted 469,303 of the 1,000,000 17½ per cent. convertible 4s. preference shares offered by way of rights at 10s. each. The balance of 530,697 shares, or 53 per cent., will be taken up by the underwriters.

UNITED GAS INDUSTRIES, LIMITED, London, W.C.2—Group net profit for the year ended March 31, 1961, is £157,742 (loss £167,672) and the ordinary dividend is increased to 12½ (2½) per cent. The reorganization of the company's activities into three divisions has continued and the resulting benefits are already reflected, states the chairman, Mr. H. H. Bates.

JOHN WALLACE & SONS, LIMITED, agricultural engineers, machinery and engineers' merchants and agents, of Glasgow—The company has exercized its rights and has purchased the balance of 1,500 £1 shares in Arthur Productions (Clydebank), Limited, at a price of £33,000 to be satisfied by the allotment of 73,000 ordinary 2s. shares in John Wallace, together with a cash payment of £150.

CARBON ELECTRIC HOLDINGS, LIMITED—Dealings are expected to start on Monday on the London Stock Exchange in the ordinary part of the two-tier capital. There is in issue £100,000 in ordinary 1s. shares and the same amount in "A" ordinary shares, ranking *pari passu*, except that the "A" shares are not entitled to a dividend. The "A" shares, however, are convertible into a similar number of ordinary after annual profits, subject only to tax, have attained £120,000, or 58 per cent. above the 1960 level.

WALMSLEY (BURY) GROUP, LIMITED, makers of pulp and paper making machinery, iron and non-ferrous castings, etc., of Bury (Lancs)—Shares have been issued to the group by Perry Engineering Company, Limited, South Australian mechanical and structural engineers. The issue, consisting of 120,000 ordinary 10s. shares in Perry at 15s. premium will raise £A150,000 which will be used to buy tools and plant for expansion. Perry has entered into an agreement to make Walmsley paper making and pulping equipment in Australia.

RICHARDSONS, WESTGARTH & COMPANY, LIMITED—In view of the changing pattern of demand as between marine engineering and land based power plant industries, there would have to be greater dependence on land work in the future, Mr. O. J. Phillipson, chairman, told the annual meeting. Major changes were under way to improve efficiency in production and administration, he said. It had been decided to change from the relatively self-contained subsidiary company structure to centralized control. An exception would be made for the Humber Graving Dock & Engineering Company, Limited, because of the nature of its business and location. This policy would require changes among the group's senior executives.

Sir Lindsay Parkinson Board is Confident

MAINTENANCE of a 15 per cent. dividend, previously forecast for 1961, on capital to be increased by a one-for-10 scrip issue, is unlikely to be altered by the Chancellor's recent call for restraint, says Mr. A. E. Parkinson, chairman of Sir Lindsay Parkinson & Company, Limited, public works contractors, of London, S.E.1, but he adds the proviso that the forecast is subject to the imposition of no further restrictions before the end of the year. It is too early to assess precisely what effect economic restraints will have upon the trading position.

Value of the group's work in hand has risen to £24,000,000 (£20,000,000) and the board's confidence is indicated in the scrip issue and dividend forecast, adds Mr. Parkinson. Open-cast coal, he said, was running at a lower level in 1960, but long-term contracts continue and output is still on a substantial scale, particularly in the area where anthracite is produced.

Group net profit increased to £202,068 (£153,117) in the year and the balance is after a proposed payment of £10,000 to Mr. H. S. Frost, a former managing director, on his resignation owing to disability.

AMAL, LIMITED—Mr. F. W. Clibbery has been appointed managing director and Mr. R. G. Hutchings and Mr. D. S. Izon directors of the company, a subsidiary of Imperial Chemical Industries, Limited.

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Board Changes

AMALGAMATED METAL CORPORATION, LIMITED—Sir Douglas Thomson has been appointed a director.

JENOLIZING COMPANY, LIMITED—Mr. J. V. Bishop, general manager of Jenolite, Limited, has been co-opted to the board.

SUPERHEATER COMPANY, LIMITED—Mr. J. Mayer has been elected a director and Mr. J. V. Santry has retired from the board.

BRUSH ELECTRICAL ENGINEERING COMPANY, LIMITED—Mr. W. A. Dick-Cleland has been appointed director of manufacturing.

METALASTIK, LIMITED—Mr. G. F. Laurence, director of technical services, has been appointed a deputy managing director.

PORTER ENGINEERING COMPANY, LIMITED—Works manager since 1954, Mr. W. R. Irving has been appointed a director.

S. SMITH & SONS (ENGLAND), LIMITED—Mr. R. M. Aldrich, Mr. E. Desmond, Mr. E. Swinbank, and Mr. T. S. Yorke have been appointed special directors.

SOUTH-DURHAM STEEL & IRON COMPANY, LIMITED—Mr. S. Scott, chief production engineer, Mr. S. H. Walker, chief development engineer, and Sir Duncan Anderson, have been elected to the board.

RICHARDSONS, WESTGARTH & COMPANY, LIMITED—Mr. A. D. McN. Boyd has been appointed a vice-chairman (executive) and Mr. G. L. Hunter has succeeded Mr. J. R. Mackay as managing director of the group.

ROWNSON CONVEYORS, LIMITED—Mr. P. Hoyle has been appointed to the board of the company, a member of the Baker Perkins, Limited, group. He continues as deputy manager of the bakery machinery department of the parent company.

PIRELLI-GENERAL CABLE WORKS, LIMITED—Mr. G. A. Baricalla has resigned from his position as managing director and has been elected vice-chairman of the company. Mr. G. Venosta, general manager, has been appointed managing director from August 1.

NORRIS WARMING (HOLDINGS), LIMITED—Mr. R. T. Kerrison has been elected chairman following the recent death of Mr. J. H. Caramel. Mr. G. R. Mackay has been appointed deputy chairman. Mr. A. Davey and Mr. R. S. Goad have been appointed joint managing directors.

BRITISH RAILWAY TRAFFIC & ELECTRIC COMPANY, LIMITED—Mr. C. A. Riches, manager, has been appointed to the board of the company, a subsidiary of the British Wagon Company, Limited. Mr. A. A. Marians, manager, has been appointed to the board of B.W. Trade Facilities, Limited, another British Wagon subsidiary.

BAKER PERKINS, LIMITED—Mr. S. W. B. Sampson has been appointed finance director from September 4. He was for some time chief accountant with the International Finance Corporation in Washington. Mr. Sampson will be assisted by Mr. P. R. Edmunds, who has been appointed group controller with increased responsibility for co-ordinating group accounting matters.

T. C. JONES & COMPANY, LIMITED—Mr. Peter Bonner has been appointed a director of the company which is an associate of the George Cohen 600 Group, Limited. Mr. Bonner served his apprenticeship with Dorman, Long & Company, Limited, and has held technical sales, production engineering, and managerial posts with Ashmore, Benson, Pease & Company, Limited, a member of Davy-Ashmore, Limited, group.

CAPE ASBESTOS COMPANY, LIMITED—The following appointments have been made within the group: Mr. R. H. Dent, deputy chairman and managing director, has been elected chairman of Cape Insulation & Asbestos Production, Limited, Cape Building Products, Limited, and Marinite, Limited. Mr. R. S. G. Riley becomes chairman of Cape Asbestos Fibres, Limited, and Mr. L. C. Dawson has been elected chairman of Kismet, Limited, and Capasco, Limited, and has joined the board of Small & Parkes, Limited. Mr. A. G. Grant has been elected chairman of Andersons Insulation Company, Limited. Sir Victor Shepheard has joined the board of Marinite, and Mr. L. W. West has been appointed managing director of Kismet.

NUCLEAR DEVELOPMENTS, LIMITED—Mr. J. N. V. Duncan, managing director of Rio Tinto Company, Limited, has been elected to the board and appointed chairman of the company, which was formed last April by the metals division of Imperial Chemical Industries, Limited, Rolls-Royce, Limited, and Rio Tinto, Limited. Other directors are Mr. R. W. Wright and Sir Mark Turner, deputy managing director and director respectively of Rio Tinto; Mr. J. D. Pearson and Mr. A. A. Rubbra, chief executive and deputy chairman, and director, respectively, of Rolls-Royce; and Mr. L. Barman, special executive of that company. Dr. J. Taylor, director of ICI metals division, and Mr. St. J. de H. Elstub and Dr. R. L. P. Berry, chairman and director respectively of ICI metals division, have also been appointed to the board. Mr. S. S. Smith has been appointed executive director and general manager and Mr. P. J. G. Elwes, secretary.

Law Cases

NCB Liable for Damaged House Repairs

AT Durham County Court, the National Coal Board was ordered to bear the cost of repairs to a house at Millfield, Sunderland, which, Mr. J. E. Thompson claimed, had been damaged by mining subsidence. Judge Goss, giving deferred judgment, said an architect and mining engineer had both stated in evidence that the damage to the dwelling was due to subsidence, while the NCB claimed that the house had been badly built and damage was due to old age and decay.

It had been pointed out on behalf of the applicant that if the board's contention was correct, all the dwellings in his street would have shown similar signs of decay, having been built at the same time.

Judge Goss decided that the Coal Board should be responsible for external repairs only. Damage inside the dwelling, he stated, was due to the age of the building, and the board was not responsible.

ACTION AGAINST DIRECTORS ADJOURNED

MOTION by Mr. Cyril Edwin Harper, a director of Harper Engineering & Electronics, Limited, London, W.1, before Mr. Justice Widgery in the Vacation Court, asked that Mr. Harper's co-directors, Sir Stanley Rawson, Mr. Alfred Neate, Sir Patrick Hamilton, Mr. John Graham Hassell Medley, and Mr. Edwin Masterman Morris, and the company itself, be committed to Brixton Prison for their alleged contempt of Court in relation to two undertakings given to Mr. Justice Cross, on July 14 and 21, respectively, not to interfere with the plaintiff in the exercise of his functions as a director of the company.

The judge agreed to an application for an adjournment to August 23, to give the defendants an opportunity to answer the evidence filed on behalf of the plaintiff.

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Growth of ECSC Steel Capacity by 1964

IT is estimated by the High Authority of the European Coal and Steel Community that the six member countries will have an annual crude steel capacity of 95,600,000 tons a year by 1964, compared with 76,200,000 tons in 1960. Of this increase of about 19,000,000 tons, almost 17,000,000 tons will be accounted for by plant to make LD and rotor steels, while the capacity for basic Bessemer steel is expected to drop slightly as out-of-date equipment is scrapped.

Potential of the German steel industry, in absolute terms, is expected to grow most—from about 35,000,000 tons last year to about 41,000,000 tons in 1964, but Italy, whose output is expected to rise from not quite 9,000,000 tons to nearly 13,000,000 tons, will show the greatest rate of growth.

The estimates are contained in a report by the High Authority dealing with the probable development of productive capacity—not with the development of markets. It contains the warning that "while the production potential figures indicated for the various stages in the iron and steel industry seem to dovetail satisfactorily with one another, it is less certain that they are properly in line with probable outlets."

Particular concern is felt by Community experts about the rapidly growing capacity for sheet steel. Capacity for cold-reduced sheet is expected to increase steadily from 7,700,000 tons last year to 13,400,000 tons in 1964, with only some slight relief coming from a reduction of capacity for hot-rolled sheet from 3,220,000 tons to 3,200,000 tons.

Australia Controls Iron-ore Exports

AN embargo has been placed on the export of iron ore from three recently-discovered deposits in Queensland. Mr. Evans, State Minister for Mines, said the areas concerned were the Constance range in the north, the Cracow field, and Kianga in Central Queensland. The Government was prepared to allow exports of iron ore from other areas.

Meanwhile the Western Mining Corporation, Limited, is to receive mining and export rights to 2,000,000 tons of iron ore deposits at Tallering Peak, 300 miles north of Perth. The Western Australian Government has authorized the negotiation of an agreement with the company for the export of ore at the rate of 500,000 tons a year.

The Western Mining Corporation has also been granted a temporary reserve over 50 square miles of surrounding country, as well as a reserve near Geraldton, to explore for coal.

Tecalemit Group Reorganized

NEW company, Tecalemit (Engineering), Limited, has been formed to carry out the manufacturing, engineering, and selling activities of Tecalemit, Limited, lubrication, hydraulic and filtration engineers, of Brentford (Middx). Tecalemit, Limited, is now a holding company for the group.

Board of the new company will consist of:—Mr. S. G. Gates (chairman), Mr. P. R. Scutt (managing director), Mr. T. R. Hardman, Mr. J. E. Drinkwater, Mr. H. E. Jackson, Mr. P. N. Nicholas, and Mr. A. D. N. Priestley.

Firms "Lack Confidence" to Capture Exports

MANY smaller manufacturers tend to lack confidence in their ability to capture and sell in oversea markets, says the report of a survey into the reasons for British firms failing to export, carried out for the Institute of Directors' Export Action Now Committee. The 52 firms questioned had fewer than 300 employees because it was felt that it was among the smaller firms that the greatest expansion of exports was possible.

The report says: "Many of these manufacturers tend to lack confidence in their ability to capture and sell in oversea markets. In a number of respects they feel their firms are too small to adapt their goods for foreign markets, or to employ an export manager—or even a clerk—to deal efficiently with their export trade, or to allow the managing director to travel abroad and make the necessary contacts."

Of the firms surveyed about 25 per cent. were exporting vigorously; the exports of 50 per cent. were declining or stationary at a low level; and just under 25 per cent. had never exported and were not really interested in doing so. Less than 10 per cent. of the non-exporting firms wanted to export but did not know how to set about it.

Reduced Demand for German Steel

GRADUAL falling off in demand has caused the German steel industry to work slightly below capacity, though it still has a backlog of 5,000,000 tons of orders for rolled products. According to an estimate made by the Rhenisch Westphalian Economic Research Institute, this is enough to keep the mills busy for two and a half months, compared with an order-book of from three to four months a year ago.

Reduced demand has not yet made much impact on production figures. Crude steel output in the first six months of the year came to 17,270,000 tons, or 3.5 per cent. better than in January-June, 1960. March produced the record for production per day, which now stands at 106,000 tons, made possible by gradually increasing capacities. The full March result was 3,080,000 tons.

Recent Wills

BILLINGHAM, J. C., chairman of the Saunders Valve Company, Limited £51,235

HAYES, THOMAS, machinery and metal merchant, of Deane, Bolton (Lancs) £46,804

WOODCOCK, FRANK, a director of the Helical Bar & Engineering Company, Limited £10,976

WINDLE, E. H., retired foundry foreman, of Brimington, near Chesterfield (Derbyshire) £6,033

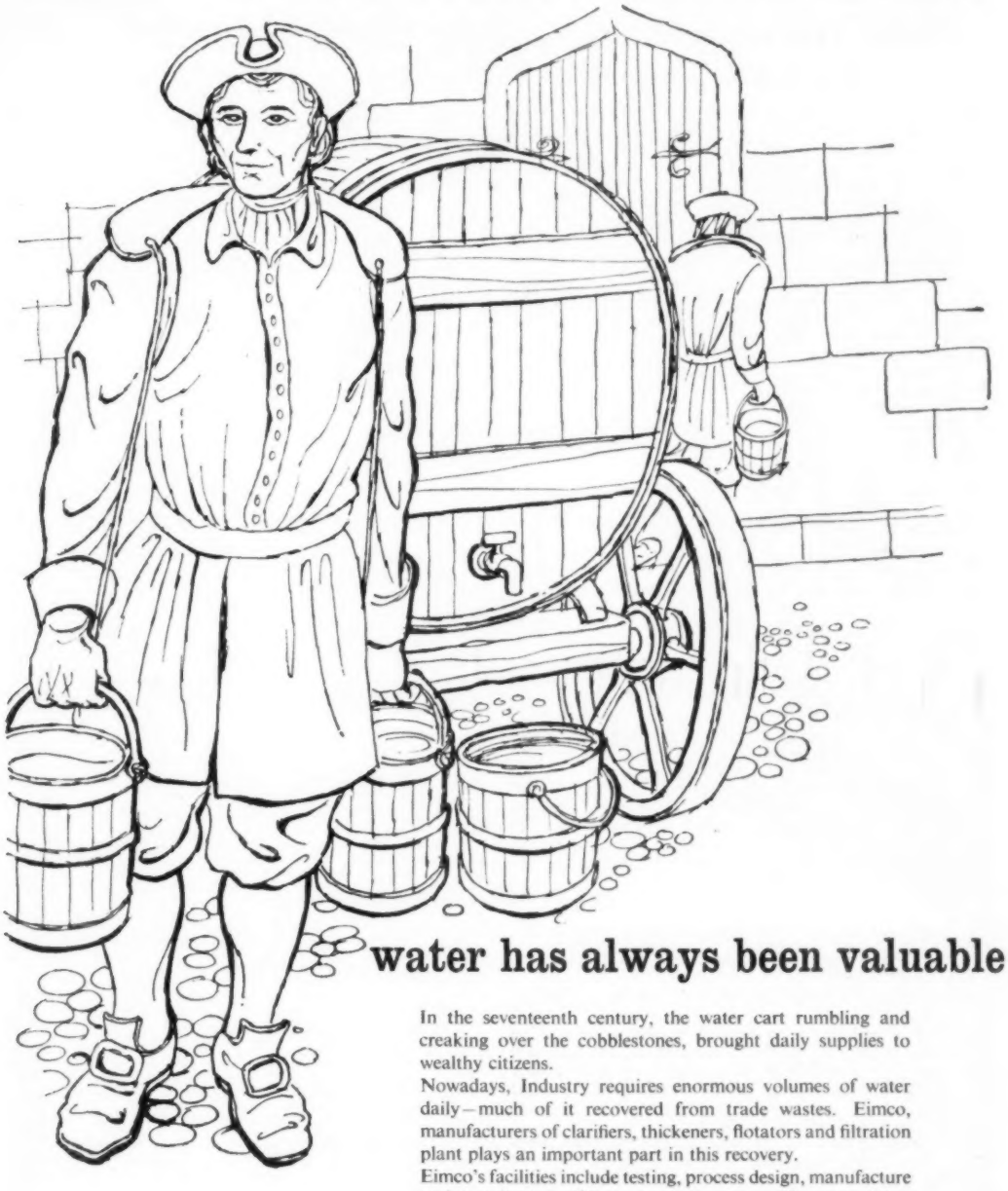
SYM, RALPH, of Bramhall (Ches), and a former iron-founder of Heaton Moor, Stockport £36,540

PHILLIPS, W. E., former managing director of Llanelly Associated Tinplate Companies, Limited, and associated with the tinplate industry all his working life £17,779

FORSTER, W. H., former director of the Caledon Shipbuilding & Engineering Company, Limited, and a member of the Institute of Engineers and Shipbuilders in Scotland £32,338

RICE, J. T. formerly assistant production manager for the No. 3 Area, East Midlands Divisional Coal Board, and at one time agent to the Bolsover Colliery Company, Limited £24,695

ROGER, SIR ALEXANDER, former chairman and first honorary president of British Insulated Callender's Cables, Limited, and a former chairman of the Birmingham Small Arms Company, Limited ... £211,028



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P3547

GEC Orders and Sales Up Last Year

DESPITE the sharp fall in profits, reported recently, orders received by the General Electric Company, Limited, in the year to March 31, 1961, increased to £127,891,000 (£118,755,000) and, at the year-end, outstanding orders amounted to £149,029,000 (£137,863,000). Sales increased by 1.4 per cent. to £118,595,000, comprising home organization £87,114,000 (£88,343,000) and oversea £31,481,000 (£28,590,000).

The increase in sales by oversea subsidiaries was achieved from locally manufactured products, rather than by exports to them from the company's factories in the UK, the directors state. In general the level of profits earned by oversea subsidiaries improved, but is still unsatisfactory.

In view of the rapid development of the industry the board feels that research expenditure must be increased in the long-term interests of the company. The problem is that in important areas of the company's activities, profit margins are totally inadequate to finance research work on the appropriate scale.

Machine-tool Exports Rose in May

FEARS that last year's boom in the machine tool industry had collapsed are not completely justified by figures issued last week by the Machine Tool Trades Association. These show that the deterioration in the first four months of the year was checked in May, when both deliveries and orders began to improve. Although the value of all new orders received by the industry in May was 6 per cent. below the figure for a year earlier, new export orders were noticeably larger.

The association claims: "One possible factor in this increase is the relatively better competitive position on deliveries, by comparison, particularly with West Germany, which the home industry has now achieved." There is a discrepancy of only 1 per cent. between the export orders for the first five months of 1960 and the same period this year. Home orders are not so encouraging and are 19 per cent. less than in the corresponding months of last year.

NO "DECLINE AND FALL" OF BRITISH SHIPBUILDING

CHAIRMAN of Vickers, Limited, Viscount Knollys, speaking at Barrow-in-Furness, said that a good deal was heard at the present time about the decline and possible fall of British shipbuilding, but this was not true. Fair criticisms were mixed up with rather too wide generalizations. Much remained to be done to improve the industry's competitiveness, but the industry was determined to do it.

Referring to the company's new £4,000,000 dry-dock, now being completed on the Tyne, as an "act of faith" in the future of shipbuilding, Lord Knollys said that costs were the vital factor in maintaining competitiveness in world markets, and the co-operation of workers was essential as well as that of the Government in ensuring that the industry was not handicapped by financial measures which must, in the end, increase costs.

HELICAL BAR & ENGINEERING COMPANY, LIMITED—Mr. W. Ellison has been appointed a director.

Increases of Capital

MIDLAND ALUMINIUM, LIMITED, increased by £415,000, in 5s. ordinary shares, beyond the registered capital of £825,000.

EXPANDITE, LIMITED, London, N.W.10, increased by £250,000, in 2s. 6d. ordinary shares, beyond the registered capital of £250,000.

POWER UNIT ENGINEERING, LIMITED, Leeds, increased by £22,000, in £1 ordinary shares, beyond the registered capital of £3,000.

BRADBURN METALS, LIMITED, Birmingham, increased by £18,000, in £1 ordinary shares, beyond the registered capital of £2,000.

STAINLESS STEEL PLANT, LIMITED, Blackpool, increased by £12,900, in £1 ordinary shares, beyond the registered capital of £100.

BERYLLIUM & COPPER ALLOYS, LIMITED, London, S.W.1, increased by £9,000, in £1 ordinary shares, beyond the registered capital of £1,000.

ROLLED STEEL PRODUCTS (LONDON), LIMITED, London, E.C.2, increased by £8,000, in £1 shares, beyond the registered capital of £2,000.

MACREADY'S METAL COMPANY, LIMITED, London, N.1, increased by £290,000, in 5s. ordinary shares, beyond the registered capital of £210,000.

SHEFFIELD SMELTING COMPANY, LIMITED, Sheffield, increased by £900,000, in £1 ordinary shares, beyond the registered capital of £600,000.

WEST MIDLAND STEEL STOCKHOLDERS, LIMITED, Birmingham, increased by £4,000, in £1 ordinary shares, beyond the registered capital of £1,000.

DARROLD ENGINEERING COMPANY, LIMITED, Lye (Worcs), increased by £15,000, in £1 ordinary shares, beyond the registered capital of £10,000.

AURORA GEAR & ENGINEERING COMPANY, LIMITED, Sheffield, increased by £250,000, in 1s. ordinary shares, beyond the registered capital of £500,000.

DUDLEY HILL ENGINEERING COMPANY, LIMITED, Lytham (Lancs), increased by £24,000, in £1 ordinary shares, beyond the registered capital of £1,000.

INTERNATIONAL MEHANITE METAL COMPANY, LIMITED (Surrey), increased by £40,000, in £1 ordinary shares, beyond the registered capital of £10,000.

TOLEDO WOODHEAD SPRINGS, LIMITED, Aycliffe (Co. Durham), increased by £300,000, in 4s. ordinary shares, beyond the registered capital of £200,000.

INASCO, LIMITED, iron and steel merchants, etc., of London, E.C.2, increased by £19,900, in £1 ordinary shares, beyond the registered capital of £100.

E. A. FOULDS, LIMITED, iron masters and founders, etc., of Colne (Lancs), increased by £19,000, in £1 shares, beyond the registered capital of £1,000.

FERRO METAL & CHEMICAL CORPORATION, LIMITED, of London, W.C.1, increased by £40,000, in £1 ordinary shares, beyond the registered capital of £10,000.

SHARMAN & LADBURY LIMITED, iron, steel, and metal merchants, etc., of Melton Mowbray, increased by £72,000, in £1 ordinary shares, beyond the registered capital of £3,000.

ENTONES (METAL BROKERS), LIMITED (formerly Copeley Metals, Limited), London, E.C.2, increased by £30,000, in £1 ordinary shares, beyond the registered capital of £20,000.

MORLEYS (BIRMINGHAM), LIMITED, iron, steel, and metal merchants, etc., of Birmingham, increased by £40,000, in £1 ordinary shares, beyond the registered capital of £60,000.

A.P.V. COMPANY, LIMITED, makers of stainless steel and alloy vessels, etc., of Crawley (Sussex), increased by £250,000, in 10s. ordinary shares, beyond the registered capital of £2,150,000.

WESTCOL, LIMITED, electrical and mechanical dril manufacturers, etc., of London, E.C.3, increased by £180,000, in £1 ordinary shares, beyond the registered capital of £20,000.

STAR ENGINEERING COMPANY (WORCESTER), LIMITED, Worcester, increased by £2,000, in £1 6 per cent. cumulative redeemable preference shares, beyond the registered capital of £15,000.

W. P. B. BUTTERFIELD, LIMITED, tank manufacturers, etc., of Shipley, increased by £500,000, in £1 5½ per cent. cumulative preference shares, beyond the registered capital of £1,500,000.

KARRENA FURNACE ENGINEERING, LIMITED, London, E.C.2, increased by £7,000, in 1,000 preference shares of £1 and £24,000 ordinary shares of 5s. each, beyond the registered capital of £8,000.

OLDHAM & SON, LIMITED, mining, mechanical, and electrical engineers, etc., of Denton, nr. Manchester, increased by £250,000, in 1s. ordinary shares, beyond the registered capital of £750,000.

BLACK-CLAWSON INTERNATIONAL, LIMITED, manufacturers of papermill machinery, etc, of London, W.1, increased by £250,000, in 10s. ordinary shares, beyond the registered capital of £1,000,000.

F. E. WEATHERILL, LIMITED, mechanical handling equipment manufacturers, etc., of Welwyn Garden City (Herts), increased by £196,500, in £1 ordinary shares, beyond the registered capital of £3,500.

JOHN VILLIERS & COMPANY, LIMITED, manufacturers of and dealers in automotive engineering products, hydraulic equipment, etc., of London, W.C.2, increased by £19,900, in £1 shares, beyond the registered capital of £100.

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Advertisements accompanied by a remittance and replies to Box Numbers should be addressed to the Advertisement Manager Iron and Coal, John Adam House, 17/19, John Adam Street, London, W.C.2. If received by first post Tuesday, they can normally be accommodated in the next Friday's issue.

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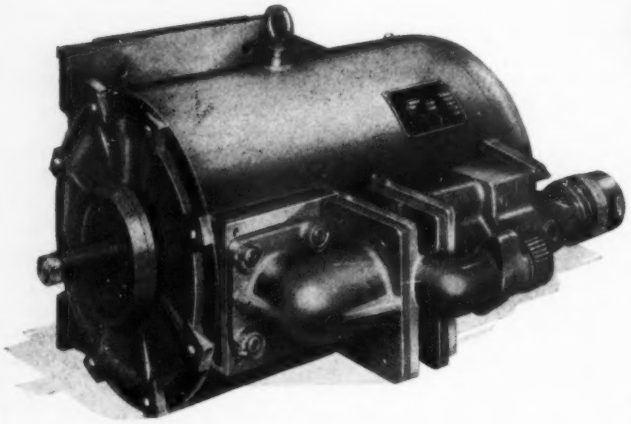

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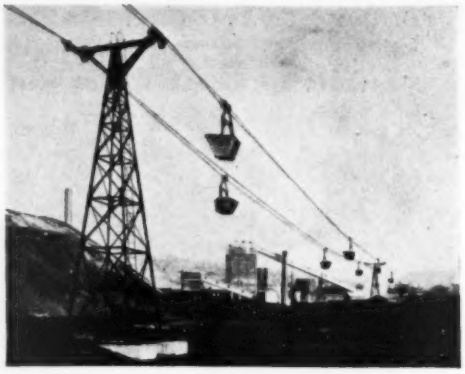

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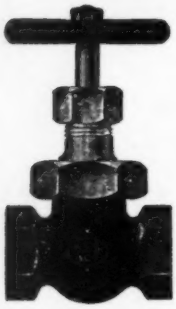

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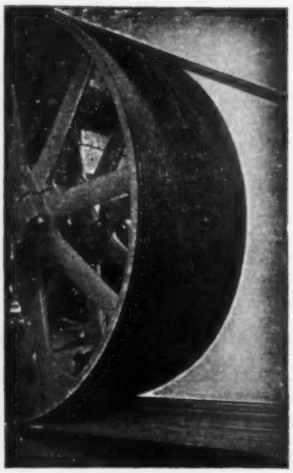

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Fig. 2.

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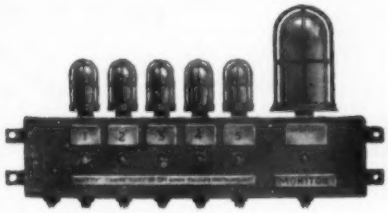

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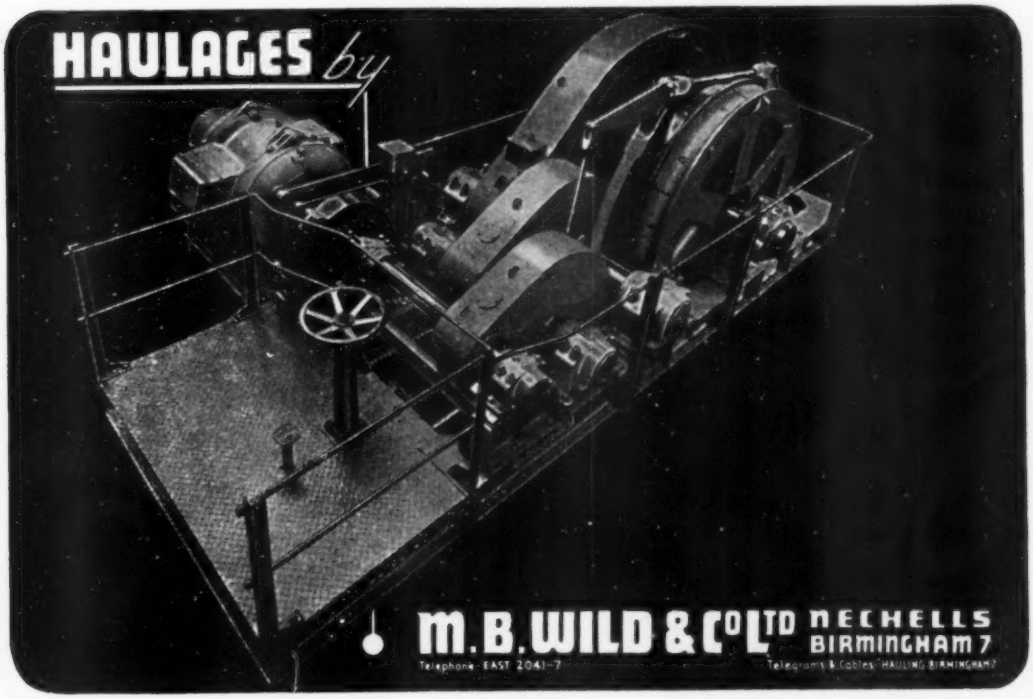

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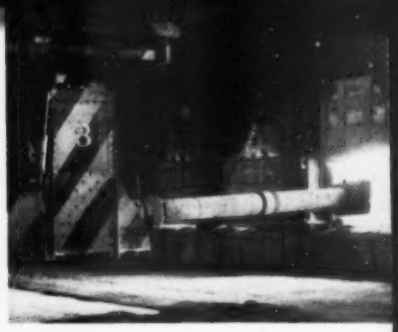

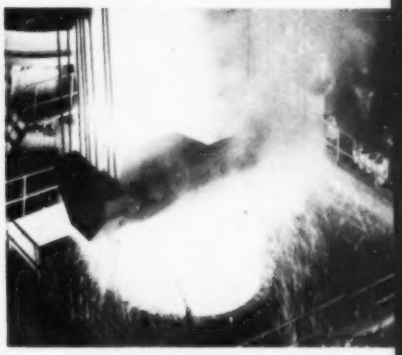

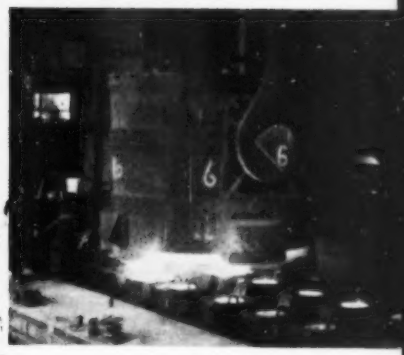

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VOL. 183 — Offices: John Adam House, 17/19, John Adam Street, London, W.C.2 — Registered as a Newspaper.
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